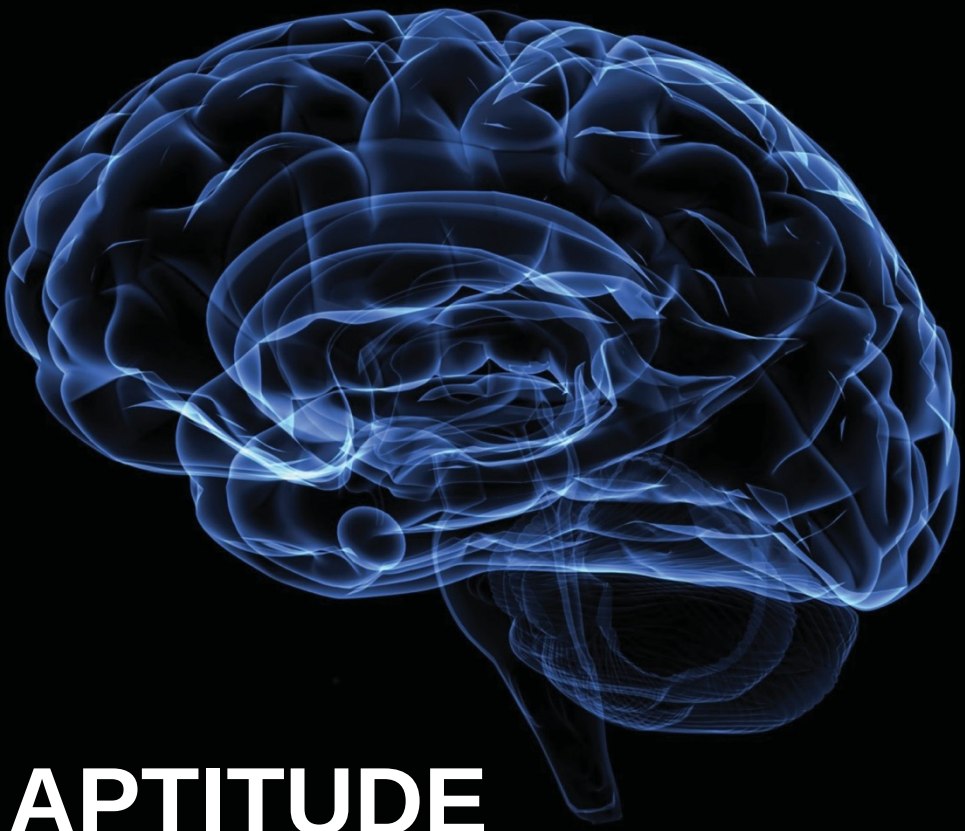
Includes
100
questions
with worked
solutions



APTITUDE TESTS

A guide of techniques for answering questions, test strategies and mind set to maximise the chance of excelling in Aptitude Tests.

TIPS
HINTS
TRICKS

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TESTIMONIALS

Finally a book that starts from where I am at – I left school at year 10 to work in a trade, and am now wanting to become a firefighter. I have never needed to use complex maths in my job so have forgotten it and this book consolidates everything I forgot from school plus so much more.

MS, Melbourne.

TABLE OF CONTENTS

INTRODUCTION

CHAPTER SUMMARY

After completing this chapter, you should be able to

- Identify and understand the target audience for the book and know what you will learn
- Know what Aptitude Testing is and how it differs to other types of testing
- Know where to find other resources

ABOUT THE BOOK

This book is especially for people who may have finished their education a long time ago (or not gotten much from their education) and need help to pass an aptitude test for a new career, scholarship or program entry.

Many people in the community left school before they could understand and become experts at the various concepts covered in this book, especially those who moved into a trade vocation rather than a professional career after a university course. As a result, they may not have previously sat exams, may rarely use mathematics and are easily stressed by the pressure from self, family or friends.

As such, this book is not targeted at high-level aptitude tests such as the GMAT undertaken by MBA candidates. It starts from basic first principles for mathematics and the other important topics – and as a result, it is unique in the market.

The book considers

A Tactics and Techniques (how you answer the various types of questions)

B Test Strategies (how you interact with the test)

C Stress Management (how you avoid choking)

Why would a book about passing an aptitude test include content on Test Strategies and Stress Management? Because you have a limited amount of time and you need to perform better than your peers to get your new job, school or scholarship. If you know how to answer the questions, but take too long or stress, you will not perform as well as you can.

WHAT IS APTITUDE TESTING?

Many organisations use aptitude tests to measure work and education-related cognitive capacity such as logical, verbal and numerical reasoning. These tests are commonly used in Australia and around the world for pre-employment screening (including but not limited to firefighters, police, military and emergency services), selective school entry exams and scholarship tests and other organisations to name a few.

In the aptitude test, each question has only one correct answer and the tests are designed such that everyone can answer all questions, but between only one and five percent of the population can answer all questions in the allocated time.

To perform well at an aptitude test, you must be prepared, well-rested and in the mindset of the test author. This means you must be able to quickly identify, interpret and extend patterns.

> **Aptitude (noun)**
>
> **1. Capacity; ability; innate or acquired capacity for something; talent**
>
> **2. Readiness or quickness in learning; intelligence**

reference: www.dictionary.com

FURTHER RESOURCES

Most organisations that utilise aptitude testing processes publish some sort of support material for candidates. This information, both free and paid, is available from around the world via the internet.

Institute of Psychometric Coaching (Vic)
www.psychometricinstitute.com.au/Free-Aptitude-Tests.asp
Practice Aptitude Tests Ltd (UK)
www.practiceaptitudetests.com/
Aptitude Test (Denmark)
www.aptitude-test.com/
University of Kent (UK)
www.kent.ac.uk/careers/psychotests.htm
Department of Education (Vic)
www.education.vic.gov.au/school/parents/secondary/Pages/practicetests.aspx
ADF Mentors (Vic) (Training Agency)
www.adfmentors.com.au/example-tests/you-session-test/
Defence Force Recruiting (Aus) (Training Agency)
http://content.defencejobs.gov.au/pdf/triservice/DFT_Document_GuideToAptitudeandAbilityTesting_20140402.pdf
Revelian (Qld) (Testing Agency)
www.revelian.com/
Australian Council for Educational Research (Vic) (Testing Agency)
www.acer.edu.au/
PsychPress (Vic) (Testing Agency)
www.psychpress.com.au/Psychometric/psychometricexample.asp
Job Test Prep (UK)
www.jobtestprep.co.uk/aptitudetest.aspx?idev_username=Studentbee
Pilot Aptitude Training Systems (Vic) (Training Agency)
www.pilotaptitude.com/?page=Home/OurServices
Metropolitan Fire Brigade (Vic) (Client Organisation)
www.mfb.vic.gov.au/Recruitment/Selection-Process/Written-Selection-Test.html
ACCA Careers (US) (Blog)
www.accacareers.com/career_centre/big-4-aptitude-tests-2/

TACTICS AND TECHNIQUES

CHAPTER SUMMARY

After completing this chapter, you should be able to

- Identify and understand the various types of tests that will be undertaken in your Aptitude Test
- Be able to convert a narrative into a mathematical formula to solve
- Know what work you should do to be ready to solve questions – especially practice and checking
- Identify what question-solving strategies are available, when to apply each of them and know how to apply them
- Know the core mathematical processes and have an understanding of anchor numbers
- Understand the various numerical reasoning question types and how to answer them
- Understand the various diagrammatical reasoning question types and how to find the wrong answers a lot quicker than finding the right answer
- Understand the various numerical reasoning question types and how to answer them
- Understand the various verbal reasoning question types and how to answer them
- Understand the various mechanical reasoning question types and how to answer them

TEST TYPES

There are four primary test types designed to test your cognitive ability.

These tests are:

1. **Numerical reasoning** – tests your ability to quickly and accurately deal with numbers, ratios, percentages, trends
2. **Diagrammatical reasoning** – tests your logical reasoning ability, to infer a set of rules and apply those rules to a new situation
3. **Verbal reasoning** – tests your ability to think constructively and comprehend text
4. **Mechanical reasoning** – tests your abilities to solve practical problems. Depending on the career path you are following, these may not be used.

SOLVING QUESTIONS

- As far as practical, do the easiest ones first to maximise points early
- Group questions by theme
- Once you understand the theme, develop your own technique to solve the questions
- Practice, practice, practice
- Do calculations the fastest possible way – on paper or in your head. Make sure that you have calculations paper available
- Always check the answers – does it “feel” right? Is the scale right?

SOLVING STRATEGIES

There are a number of strategies available to solve questions. These are more applicable to different styles of questions:

1. **Trial and error** – this strategy is better for questions where there are options available and you can confirm the initial assumption. A good use is in pattern recognition. A matrix may have the numbers 5, 10, X. The initial step may be + 5 or x 2.

2. **Eliminate wrong answers** – this strategy is best for solving diagrammatical questions or other multiple-choice style questions where you can more easily eliminate items that don't fit than find the ones that do

3. **Logical processes** – this strategy is best used for data analysis where you can just step through a series of actions to solve a problem.

The student should select the most appropriate Solving Strategy based on the question type and their strengths and experience.

NUMERICAL REASONING

There are three themes of questions in Numerical Reasoning portions of Aptitude Tests:

1. **Core mathematics**
2. **Pattern recognition**
3. **Data analysis**

Tactics and Techniques to solve questions for these themes are detailed in the following sections.

Numerical Reasoning: Core Mathematics

You will need to remember core mathematical principles:

- Know the operators: plus (+), minus (-), multiplication (x), division (÷, /), brackets () and powers (x^y)
- Know what order to solve operators – solving from left to right or using BODMAS (also known as BIDMAS)
  - B brackets
  - O orders (powers) or I (indices)
  - DM division and multiplication
  - AS addition and subtraction
- Always ensure that you put numbers in the correct column (10's in the 10's column etc)
- Set and know Anchor Numbers
- Know your times' tables
- Where time allows, use trial and error, especially for more complex operations like division and multiplication
- Always check the calculation – does it feel right?

What is an Anchor Number?

An Anchor Number is a familiar number that you know all of the operations to get this number as a solution. You should select a range of numbers that can be used during the test. These would generally be multiples of one hundred.

Worked Example

$$\frac{380}{19} = ?$$

If you have 400 as an anchor number:

$$20 \times 20 = 400 \; and \; 50 \times 8 = 400 \; and \; 8 \times 50 = 400$$
$$4 \times 100 = 400 \; and \; 100 \times 4 = 400$$
$$16 \times 25 = 400 \; and \; 25 \times 16 = 400$$

You can see that 380 is 20 less than 400, so

$$\frac{380}{19} = 20$$

How do you easily calculate 1680/12?

Have set anchors as 1200 and multiples of 120.

$$\frac{1680}{12} = \frac{1200 + 480}{12} = \frac{1200}{12} + \frac{480}{12} = 100 + 40 = 140$$

Times Tables Reminder

You probably have bad memories from school having times tables drilled into by your teacher, repeating the song until it was stuck in your head. Now is the opportunity for it to pay off.

X	1	2	3	4	5	6	7	8	9	10	11	12	15	20
1	1	2	3	4	5	6	7	8	9	10	11	12	15	20
2	2	4	6	8	10	12	14	16	18	20	22	24	30	40
3	3	6	9	12	15	18	21	24	27	30	33	36	45	60
4	4	8	12	16	20	24	28	32	36	40	44	48	60	80
5	5	10	15	20	25	30	35	40	45	50	55	60	75	100
6	6	12	18	24	30	36	42	48	54	60	66	72	90	120
7	7	14	21	28	35	42	49	56	63	70	77	84	105	140
8	8	16	24	32	40	48	56	64	72	80	88	96	120	160
9	9	18	27	36	45	54	63	72	81	90	99	108	135	180
10	10	20	30	40	50	60	70	80	90	100	110	120	150	200
11	11	22	33	44	55	66	77	88	99	110	121	132	165	220
12	12	24	36	48	60	72	84	96	108	120	132	144	180	240
15	15	30	45	60	75	90	105	120	135	150	165	180	225	300
20	20	40	60	80	100	120	140	160	180	200	220	240	300	400

Core Mathematics: Addition

Addition is one of the simpler operations in maths.

- Always start the addition process from the right-hand column (ones column) moving to the left.
- Carry any ten's multiples to the next column to the left to include in the addition process.

Worked Example

What is 657 + 569?

Thousands	Hundreds	Tens	Ones
	6	5	7
+	5	6	9
Carry 1 *(from the hundreds column)* 1+0=1	Carry 1 *(from the tens column)* 6+5+1=12 *(carry 10 to thousands column)* **2**	Carry 1 *(from the ones column)* 5+6+1=12 *(carry 10 to hundreds column)* **2**	7+9=16 *(carry 10 to tens column)* **6**
1	**2**	**2**	**6**

So, 657 + 569 = 1226

Core Mathematics: Subtraction

Subtraction is one of the simpler operations in maths.

- Always start the addition process from the right-hand column (ones column) moving to the left.
- Where you can't subtract the bottom number from the top number, borrow a ten from the next column to the left to use in the subtraction process.

Worked Example

What is 657 - 569?

Thousands	Hundreds	Tens	Ones
	6	5	7
-	5	6	9
			7-9 can't do
		10 borrowed, so 5 becomes 4: 4-6 can't do	*Borrow 10 from tens column,* so 17-9=8
		Borrow 10 from the hundreds column, so 14-6=8	**8**
	10 borrowed, so 6 becomes 5: 5-5=0	**8**	
	0	**8**	**8**

So, 657 – 569 = 88

Core Mathematics: Multiplication

Multiplication is one of the harder operations in maths.

1 Know your times' tables.

2 Start operation in the right column and carry tens to the column to the left.

3 If you are multiplying by ten, simply add a zero in the ones column.

4 If you know adjacent multiples, simply add sum of adjacent and target numbers.

$$13 \times 13 = ?$$
$$13 \times 13 = 12 \times 12 + 12 + 13$$
$$12 \times 12 = 144$$
$$13 \times 13 = 144 + 12 + 13 = 169$$

5 If the numbers are too hard to multiply, split them into the component parts for multiplication and then add the portions up.

$$65 \times 47$$
$$(60 \times 40) + (60 \times 7) + (5 \times 40) + (5 \times 7)$$
$$2400 + 420 + 200 + 35 = 3055$$

6 The multiplication can be further simplified by removing the 10's for the working

The multiplication can be conceptualized as follows

Thousands	Hundreds	Tens	Ones
x		A C	B D
	A x C	A x D B x C 0	B x D 0 0 0

Worked Example

What is 74 x 89?

$$74 \times 89$$
$$(70 \times 80) + (70 \times 9) + (4 \times 80) + (4 \times 9)$$
$$(7 \times 8) \times 100 + (7 \times 9) \times 10 + (4 \times 8) \times 10 + (4 \times 9)$$
$$56 \times 100 + 63 \times 10 + 32 \times 10 + 36$$
$$5600 + 630 + 320 + 36 = 6586$$

What is 65 x 47?

Thousands	Hundreds	Tens	Ones
x		6 4	5 7
	60 x 40 = 2400	60 x 7 = 420 40 x 5 = 200	5 x 7 = 35
Sum up 2	4 2 4	3 2 0 0	5 0 0 0
Carry 10 2+1=3	4+2+4=10	3+2+0+0=5 5	5+0+0+0=0
3	**0**	**5**	**5**

So 65 x 47 = 3055

Core Mathematics: Division

Division is a very hard operation in maths.

- Know your times' tables.
- Start by writing down the multiples (to 9x) of the divisor (the smaller number going into the larger number)
- Use trial and error to determine what values you should divide into.
- Where possible, use an anchor number.
- May need to use long division
- [x) abc]
- Using long division, start operation from the left column.

Worked Example

How do you calculate 3720 / 40 using long division? [40) 3720]

			Thousands	Hundreds	Tens	Ones
					9	**3**
4	0	)	3	7	2	0
	-		3	6	0	↓
	=			1	2	0
						3

Notes

40 into 37? can't do

40 into 372? don't know

Trial

40 into 400? = 10

(can't do 372 – 400)

40 into 360? = 9 (goes on top line in tens column)

(can do 372 – 360 = 12)

Trial

40 into 120? = 3 (goes in top line in one's column)

(can do 120 – 120 = 0)

So 3720 / 40 = 93

Worked Example

How do you calculate 3720 / 40 using anchor numbers?

$$\frac{3720}{40} = ?$$

If you have multiples of 40 as anchor numbers:

$$3720 = 3600 + 120 = 360 \times 10 + 120$$
$$360 = 9 \times 40, so\ 3600 = 90\ \times 40$$
$$3 \times 40 = 120$$
$$90 \times 40 + 3 \times 40 = 93 \times 40 = 3720$$

So 3720 / 40 = 93

Consider Percentages

Don't be scared of percentages:

- A percentage is just a fraction expressed out of 100.
- Percentages are treated the same as other numbers – just the columns to the right of the decimal place.
- Don't be afraid to swap % around to make the question easier to answer – 50% of 8 is easier to answer than 8% of 50.

For example – 2657.85 where the .85 decimal is the same as 85%.

Thousands	Hundreds	Tens	Ones	Tenths	Hundredths
2	6	5	7 ●	8	5

A Bit About Fractions

- Fractions have two components:

Top line is called the Numerator

Bottom line is called the Denominator

- Most calculations with fractions will require finding a common denominator to solve.
- Most questions will require the fraction to be simplified – this means expressed with the smallest denominator.
- Remember, the larger the denominator, the smaller the value of the fraction.
- If it is hard to see what the common denominator is, simply multiply the denominator of each number.

$$\frac{a}{b}+\frac{c}{d}=\frac{a\times d}{b\times d}+\frac{c\times b}{b\times d}$$

- Remember that fractions can be written in a number of different ways, but have an equivalent (or equal) value, for example:

$$\frac{1}{2}=\frac{2}{4}=\frac{3}{6}=\frac{4}{8}=\frac{5}{10}=\frac{6}{12}=\frac{7}{14}\ etc$$

- One (1) is simply where the numerator and denominator are the same numbers.

Adding and Subtracting Fractions

- Convert fractions so that both numbers to have a common denominator.
- When you add the numbers, simply add the numerator portions.
- When subtracting fractions, simply minus the numerator portions.
- Finally, simplify the resulting number.

Worked Example

$$\frac{3}{5}+\frac{4}{7}$$

Multiply by the denominator of the other number:

$$\frac{3\times 7}{5\times 7}+\frac{4\times 5}{7\times 5}=\frac{21}{35}+\frac{20}{35}=\frac{41}{35}$$

$$\frac{35}{35}+\frac{(41-35)}{35}=1\frac{6}{35}$$

Multiplying Fractions

- Multiply both the numerator and the denominator by the numerator and the denominator of the other number.
- The resulting answer will be smaller than both of the inputs.
- Always remember to simplify the fractions as far as possible

Worked Example

$$\frac{4}{6} \times \frac{3}{7}$$

$$\frac{4 \times 3}{6 \times 7} = \frac{12}{42}$$

However, this is not the answer as it still needs to be simplified. Six (6) can go into both 12 and 42?

$$\frac{12 \div 6}{42 \div 6} = \frac{2}{7}$$

Converting Fractions to Percentages

Set an unknown number (say ***X***) as the percent expression of the fraction. This will use the long division skills developed previously.

Worked Example

Express 6/15 as a percentage.

$$\frac{6}{15} = \frac{X}{100}$$

Cross multiply the numbers

$$\frac{6}{15} = \frac{X}{100} \gg 6 \times 100 = 15 \times X \gg 600 = 15X$$

Divide by the fraction denominator

$$\frac{600}{15} = \frac{15X}{15} \gg 40 = X, so\ X = 40\%$$

Core Mathematics: Powers

Powers are hard, but don't be scared of them – they are simply multiplication in disguise.

- Powers are a number multiplying by itself a given number of times.
- Shown as a number with a superscript number [x^y] where y is the number of times that x is multiplied
- Solve in steps to simplify – you can insert brackets anywhere, just so long as the total number of numbers does not change.

For example

$$2^2 = 2 \times 2 = 4$$
$$2^3 = 2 \times 2 \times 2 = (2 \times 2) \times 2 = 4 \times 2 = 8$$
$$2^4 = 2 \times 2 \times 2 \times 2 = (2 \times 2) \times (2 \times 2) = 4 \times 4 = 16$$

Worked Example

Calculate 4^4

$$4^4 = 4^2 \times 4^2$$
$$= (4 \times 4) \times (4 \times 4)$$
$$= 16 \times 16$$
$$= (10 \times 10) + (10 \times 6) + (6 \times 10) + (6 \times 6)$$
$$= 100 + 60 + 60 + 36$$
$$4^4 = 256$$

Numerical Reasoning: Pattern Recognition

The objective of this theme is to find numbers missing from:

- A single matrix
- Several matrices
- A series of numbers
- A series of numbers in boxes

To solve the pattern recognition questions use the following 3 steps

1 **Guess pattern** – observe and guess a pattern

2 **Validate pattern** – validate the pattern (but if it is not valid – guess again)

3 **Apply the pattern** – if it is valid, apply the pattern to solve the question.

Pattern recognition can use any of the core maths operations – addition, subtraction, multiplication, division or powers.

Patterns: Single Matrix

The pattern is not in the values shown but in the difference between the values.

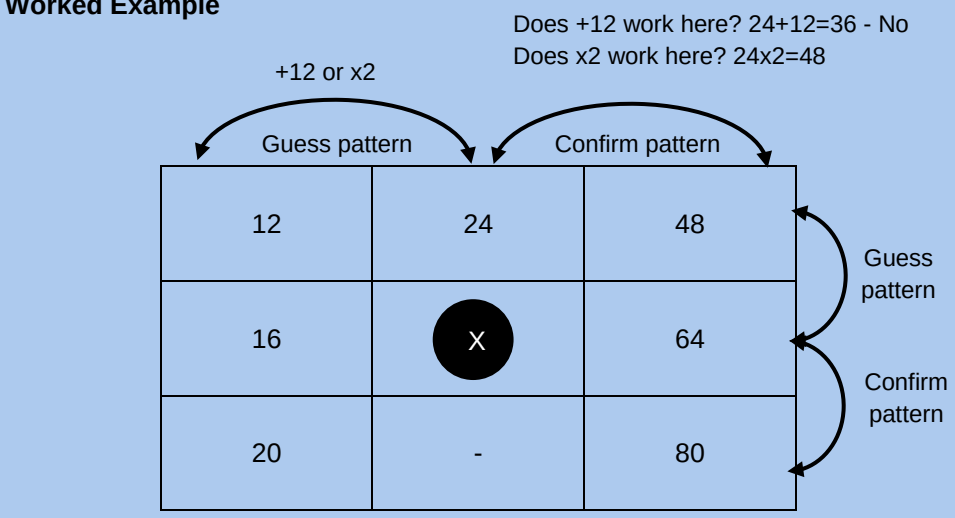
1 Guess a pattern by calculating the relationship between the values in the first row (or first column) and the values in the second row (or second column).

2 Confirmed or denied by calculating the relationship between the values in the second row (or second column) and the values in the third row (or third column).

3 If the pattern established in the first trial doesn't fit try another to fit another pattern.

Remember that there is addition (subtraction), but there is also multiplication (division) and powers. For example a pattern 2, 4 could either be 2+2 or 2x2. The subsequent trial will confirm the pattern – if it is 6, then 2+2+2 works, otherwise if it is 8, then multiplication works.

Worked Example

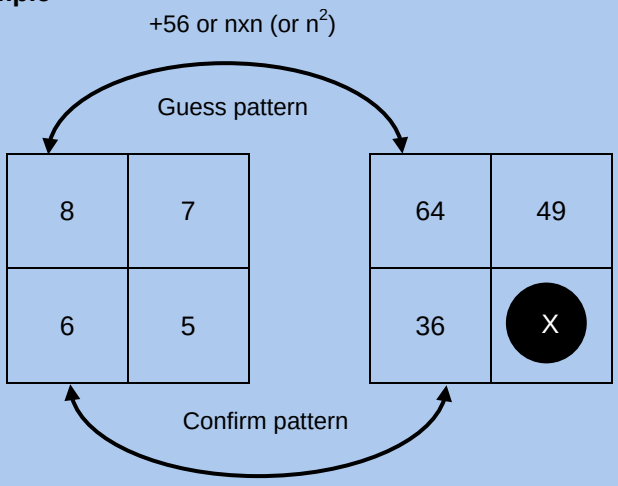


So, X = 32

Patterns: Several Matrices

You need to understand the relationship between the numbers in the matrix on the left (in any position) and the numbers in the matrix on the right (in the same, corresponding position). Sometimes there is a relationship between positions in the matrices.

Worked Example



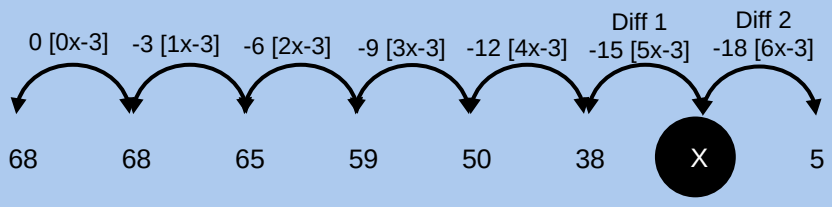
Does +56 work here? 6+56=62 – No
Does n^2 work here? $6^2 = 36$

Right matrix is square of left matrix (for same positions), so X = 25.

Patterns: A Series of Numbers

Guess this pattern by calculating the differences between the numbers – not the numbers shown. The difference between numbers may increase, but the rule will be consistent. Apply the rule to determine the value missing.

Worked Example



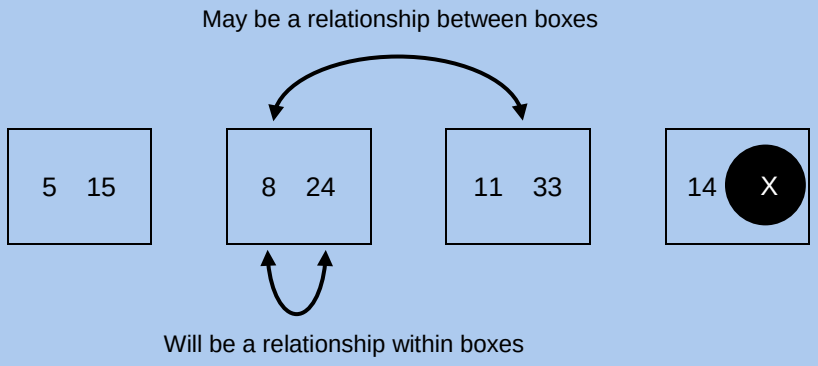
So, X = 38 – 15 = 23 >> 23 – 18 = 5

Patterns: A Series of Numbers in Boxes

The pattern is for the series of numbers in boxes is determined by the relationship between the two numbers in the box. In some questions, there may also be a relationship between figures in the corresponding position (left or right) in the boxes.

Again, with patterns in boxes, it is essential to guess the pattern (relationship) and then confirm it in subsequent boxes.

Worked Example



Second (right) number in the boxes are 3 times the numbers on the left, so X = 42.

Numerical Reasoning: Data Analysis

Data analysis is an important part of aptitude testing.

- Data analysis is simply about undertaking calculations – not about determining trends or patterns.
- Need to use the core mathematics operations – addition, subtraction, multiplication, division or powers.
- Will need to consider units (eg hours, minutes, kilometres, metres) to solve the question.
- Chance that you will need to use trial and error to solve the questions.
- Questions may need to be solved in several steps.

Finding Consecutive Numbers

A common aptitude test question is to find a sequence of consecutive numbers that add up to a given number. The question may consider:

- Number sequence of any length.
- Consecutive numbers (eg 2, 3, 4), consecutive odd numbers (eg 3, 5, 7) or consecutive even numbers (eg 2, 4, 6).
- May be asked to find some or all of the numbers in the sequence.
- Question is normally given as the sequence adds to a total number.

The solving process is a simple 2 step process

1 The mid-point of the sequence is the total divided by the number of numbers in the sequence.

2 There is then an equal number of numbers each side (more and less) than the mid-point.

Worked Example

A sequence of five (5) consecutive numbers adds up to 105, what is the highest of these numbers?

$$mid\ point = \frac{105}{5} = 21$$

19 20 21 22 23

So, highest number in the sequence is 23

A sequence of six (6) consecutive odd numbers adds up to 180. What is the sequence?

$$mid\ point = \frac{180}{6} = 30$$

25 27 29 | 31 33 35

Equivalence

Equivalence questions in aptitude tests take the form of determining the relative values of a group of items.
The solving process is simple

- Convert to the equivalent value based on the lowest value unit – this way it can be expressed as whole numbers.

Worked Example

Anne, Tim and Jane were told by mum to eat all their vegetables. All the children really like corn, don't care for peas and hate carrots and have decided that corn is twice as nice as peas, which are twice as nice as carrots. The children decide that whoever has the most "vegetable pain" gets the largest piece of chocolate cake for desert. Who will get the largest cake if they have the following vegetables on their plates?

	Anne	Tim	Jane
Corn	7	11	6
Peas	5	2	9
Carrots	6	5	3

Express the value of the vegetables in terms of the lowest value of dislike – corn. They dislike peas twice as much as corn and dislike carrots twice as much as peas (or 4 times that of corn). Express the vegetables in the equivalent of corn.

	Anne (Corn equivalent)	Tim (Corn equivalent)	Jane (Corn equivalent)
Corn	7 (7 x 1 = 7)	11 (11 x 1 = 11)	6 (6 x 1 = 6)
Peas	5 (5 x 2 = 10)	2 (2 x 2 = 4)	9 (9 x 2 = 18)
Carrots	6 (6 x 4 = 24)	5 (5 x 4 = 20)	3 (3 x 4 = 12)
Corn Equivalent	41 corn	35 corn	36 corn

Anne will get the largest piece of chocolate cake.

DIAGRAMMATICAL REASONING

There are four themes of questions in Numerical Reasoning portions of Aptitude Tests:

1. **Folded cubes**
2. **Which items do not belong in the set**
3. **Which is the next shape in the series**
4. **Extended plane visualisation**

Tactics and Techniques to solve questions for these themes are detailed in the following sections.

Diagrammatical Reasoning Overview

Diagrams used in aptitude tests are typically different combinations of a set number of features, such as

- Colours
- Shapes
- Visible patterns (eg cross, diagonal lines, straight lines)
- Number of elements
- Position in the diagram
- Size

To answer diagrammatical reasoning questions, you need to

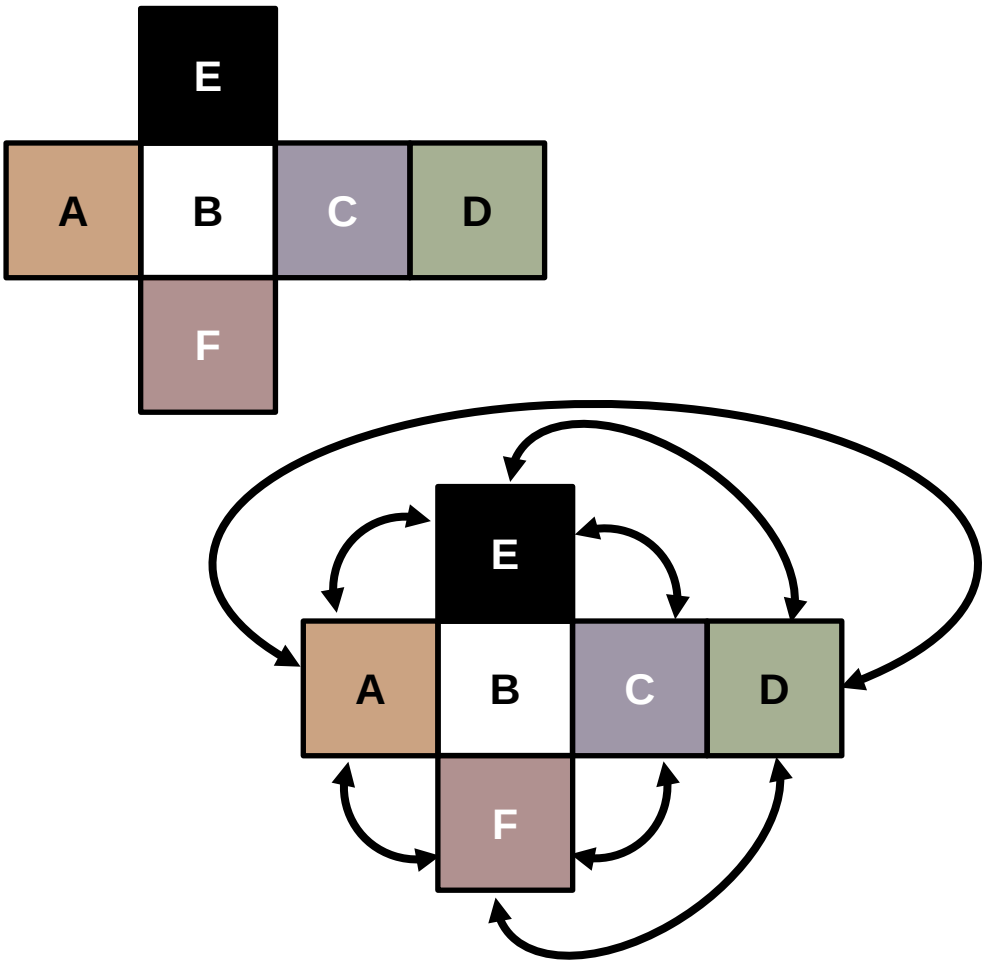
- Remember that the diagram may be a partial view from a continuous plane and the pattern may work if you move the position of a column or row
- Disaggregate (break into the component) the shapes into a number of features and identify each of these features
- Distinguish which ones are important
- Distinguish which ones are changing (or different)
- Identify a trend (or pattern) of the changes in the various diagrams
- Identify which diagrams do not fit within the pattern or trend

Diagrams: Folded Cubes

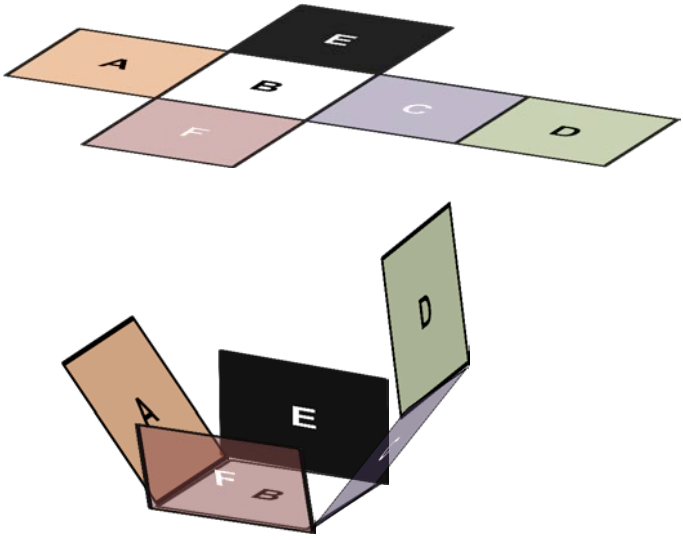
Folded cubes are a common question in many aptitude tests, used for logical visualisation of the pattern. These can either be unfolded to folded state or folded to unfolded. You should cut out some card and practice to become familiar with the rules applicable to folded cubes

1. Three edges always meet at a node (corner).
2. Faces two places apart unfolded will be opposite faces on the folded cube.
3. It is generally easiest to undertake the process of elimination to find those folded cubes that do not match.

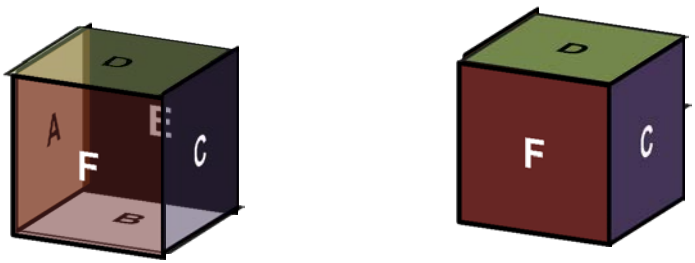
The process of determining meeting edges for unfolded cubes.



The cube folding process in three dimensions



The resulting cube can be visualised in either partially transparent or opaque (not transparent).

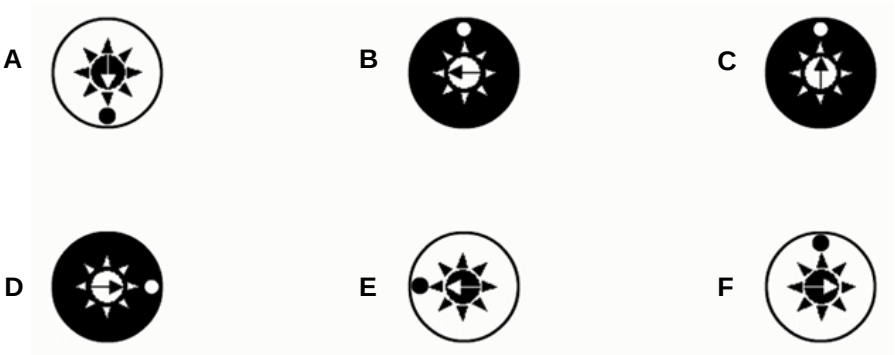


Diagrams: Items That Don’t Belong

Items that don’t belong are a common question in aptitude tests. This type of question requires you to identify common features of a group of diagrams and then identify those diagrams without these features. These diagrams most often have all of the features, but in different order or direction relative to another feature.

Worked Example

Which of the following 6 items do not belong?



The best approach to solve this question is to eliminate the wrong answer.

Start by breaking the shapes into features and decide the importance of each:

1. Outer circle with inner circle and 8 rays (all the same so adds no value)
2. Contrasting black or white in colour (3 of each, so no value)
3. Dot near the outside that moves
4. Arrow on the inside that rotates

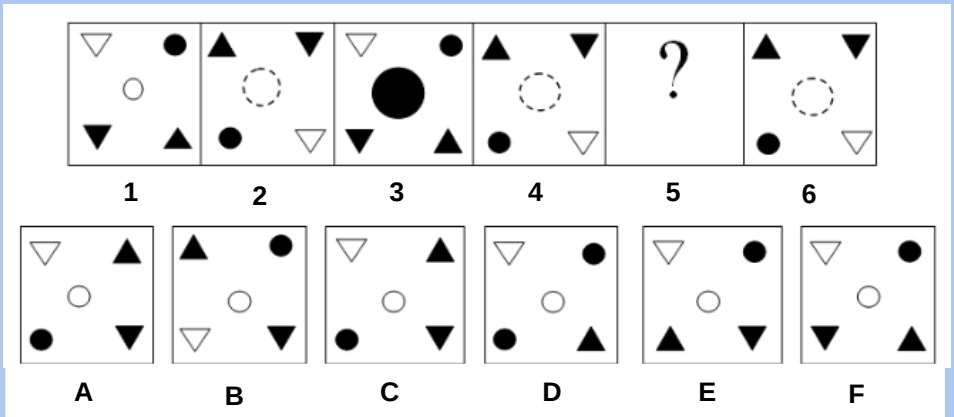
Through inspection it is clear that items in items A, C, D and E the centre arrow is pointing to the dot, so the items that do not belong are items B and F.

Diagrams: Next Shape in the Series

The “next shape in the series” questions use the same general principles as “items that don’t belong” in that you need to identify the trend in changes in common features of the diagram set, and then find a diagram from the list that meets the features.

Worked Example

What is the missing shape in the series?



The best approach to solve this question is to eliminate the wrong answer.

Start by breaking the shapes into features and decide the importance of each:

1. Circle in the middle of the square – increasing in size and changing colour (only the small white circle is offered in the options, so no value)
2. White triangle pointing down – top left corner then bottom right in subsequent squares
3. Black dot – top right corner then bottom left in subsequent squares
4. Black triangle pointing down – bottom left corner then top right in subsequent squares
5. Black triangle pointing up – bottom right corner then top left in subsequent squares

Option D can be eliminated immediately as there are 2 dots and no upwards black triangle. In square 4, the white triangle is in the bottom right, so in 5 it should be in the top left – so eliminate option B. In square 4, the black dot is in the bottom left, so in 5 it should be in the top right so also eliminate A and C. The black triangle pointing down is always in the bottom left – so eliminate E.

VERBAL REASONING

There are many themes of questions in Verbal Reasoning portions of Aptitude Tests:

1. **Proof statements**
2. **Verbal Analogy**
3. **Spelling**
4. **Answering questions based on a text**

Tactics and Techniques to solve questions for these themes are detailed in the following sections.

Proof Statements

With this type of question, you will be presented with a list of statements or facts. You will then be asked if one or more of the statements 'prove' or 'disprove' the conclusion in the test question.

The statements in the proof may be nonsense but you are not being asked about reality – only whether you can identify if specific statements (right, wrong or indifferent) support a particular statement. Your ability to apply logic is being tested.

Worked Example

Which statements together prove that Jessie likes strawberry ice cream?

a. Mum always buys vanilla ice cream
b. Jessie's brother doesn't like strawberry ice cream
c. Jessie doesn't like the same ice cream as her brother
d. Jessie is always disappointed with her mother's ice cream choices
e. Jessie always asks Mum to buy strawberry ice cream

If you combine the first, fourth and fifth statements that (e) "Jessie always asks Mum to buy strawberry ice cream", (a) "Mum always buys vanilla ice cream" and (a) Jessie is always disappointed with her mother's ice cream choices."

Verbal Analogy

Verbal Analogy questions are common in aptitude tests to identify the candidates understanding of relationships between concepts. Common strategies include

- State the relationship between the pair of words in a simple sentence
- Trial difference relationships to ensure that you have the correct relationship
- Always consider secondary meanings

Common types of verbal analogy questions:

Word Relationship	Example
Synonym	Alleviate • Reduce
Antonym	Biased • Impartial
Characteristic	Lion • Ferocious
Degree of Intensity	Cool • Freeze
Part to Whole	Keyboard • Computer
Manner	Stutter • Speak
Worker-Product	Artist • Sketch
Worker-Tool	Doctor • Stethoscope
Tool-Action	File • Smoothening

Worked Example

Driver is to Truck as Potter is to

(a) Wheel (b) Clay (c) Plate (d) Forming

Truck is the Driver's tool as Wheel is to Potter (a).

Spelling

Spelling in aptitude tests is generally based around the candidate's ability to spell those words commonly misspelt.

- Know your spelling rules
- Know your vowels (A, E, I, O, U) and consonants
- Know the use of particular words
  - ✓ 'whether' or 'weather'
  - ✓ 'which' or 'witch'
  - ✓ 'their', 'there' or 'they're'
  - ✓ 'principle' or 'principal'
- Read a lot of books to gain a good appreciation of words

Rule	Application Example
"I" before "E" except after "C". Long version of this is "I" before "E" except after a long "C" but not when "C" is an "SH" sound and not when the "EI" makes an "A" sound	["I" before "E"] believe | achieve [Except after "C"] receive | ceiling [But not when "C" is an "SH" sound] ancient | proficient [And not when "EI" sounds like an "A"] neighbour | eight | weigh
Changing "Y" to "IES" 1. If the word has a vowel before the "Y", simply add an "S" 2. If the word has a consonant before the "Y", drop the "Y" and add an "IES"	[Vowel before the "Y"] key→keys | delay→delays | trolley→trolleys [Consonant before the "Y"] baby→babies | company→companies
Adding "ES" (rather than "S") to words ending in "S", "SS", "Z", "CH", "SH" and "X"	bus→buses | business→businesses | watch→watches | box→boxes
1:1:1 doubling up rule When a word has a single (1) syllable with 1 vowel next to 1 consonant, we double up the final consonant with a vowel suffix. This still happens in longer words when the stress is on the final syllable	[1:1:1 rule with a single syllable] put→putting | swim→swimmer | big→biggest | shop→shopper | [1:1:1 rule with longer words, but stress on the final syllable] begin→beginning | refer→referring
Drop the "E" rule Drop the final silent "E" when we add vowel suffix endings. However, keep the "E" if the word ends in "CE" or "GE" to keep a soft sound, with suffix "ABLE" or "OUS"	[Drop the "E" rule] write→writing | joke→joker | close→closing [Keep with "CE" or "GE" with suffix "ABLE" or "OUS"] courage→courageous | notice→noticeable
Changing the "Y" to an "I" when adding suffix endings. If the word ends with a consonant + "Y", the "Y" changes to an "I" unless adding suffixes beginning with "I", such as "ING" or "ISH"	[Word ends with consonant + "Y"] beauty→beautiful | hungry→hungriest | angry→angrier | dry→drier [When adding "I" suffix to words with consonant + "Y"] dry→drying | apply→applying

Rule	Application Example
Making plurals out of words ending with “F” or “FE” by dropping the “F” or “FE” and replacing it with “VES”. However, where words have 2 vowels and then “F”, or end with “FF” simply add an “S”	[Drop “F” or “FE” and replace with “VES”] calf→calves | knife→knives | life→lives [2 vowels and then “F”, simply add “S”] chief→chiefs | roof→roofs [“FF” and simply add “S”] cliff→cliffs | sniff→sniffs
Words ending in “FUL” always has 1 “L”	care+ful→careful | hope+ful→hopeful
When adding “LY” to words ending in “FUL”, then we have double letters “LL”. Simply add “LY” to words ending in “E” except where the word finishes in “LE” where the “E” is dropped and replaced with a “Y”	[Adding “LY” to “FUL” words] gratefully | hopefully | faithfully [Simply add “LY” to words ending in “E”] like→likely | complete→completely [Where the word finishes in “LE”, drop the “E” and replace with a “Y”] gentle→gently | subtle→subtly
When adding “ALL” at the start of a word, drop the second “L”	also | almost | always

Most common misspelt words in the English language

acceptable	conscious	knowledge	receipt
accidentally	curiosity	kernel	receive
accommodate	consensus	leisure	recommend
achieve	definitely	liaise/liaison	referred
acquire	dilemma	library	reference
aggressive	disappear	maintenance	relevant
amateur	disappoint	miniature	remember
apparent	discipline	mischievous	resistance
appearance	embarrass	misspell	rhyme
argument	environment	necessary	rhythm
basically	exhilarate	noticeable	schedule
beginning	exceed	occasion	separate
believe	existence	occasionally	sergeant
bizarre	experience	occurrence	siege
business	familiar	pavilion	successful
calendar	foreign	perseverance	supersede
cemetery	friend	persistent	threshold
changeable	guarantee	personnel	twelfth
chauffeur	harass	piece	tyranny
colleague	humorous	possession	unforeseen
collectible	ignorance	precede	until
column	immediate	preferred	weird
coming	incidentally	principal	wherever
committee	independent	privilege	
completely	indispensable	pronunciation	
conscience	interrupt	publicly	
conscientious	irresistible	questionnaire	

Answering Questions Based on a Text

Answering questions based on a text involves drawing conclusions and relationships both explicitly (you see the word or phrase in the text) and implicitly (you need to draw conclusions from the text).
Because of the time constraints, it is not practical to read the text in detail and students should:

1 Skim the text letting your eyes look over the text quickly without really reading every word.

2 Read the question.

3 Scan the text looking for a specific section or concept for the answer to the specific question.

Worked Example

Despite their aesthetic landscaping, ease of access and generous parking, out-of-town business parks have not turned out to be the attractive proposition that speculative developers had hoped. Their polished appearance and spaciousness have failed to compensate for limited provision of basic infrastructure such as shops, banks and leisure facilities as less scrupulous developers reneged on earlier promises or struggled with cash flow problems and other difficulties. It is thought that an expansion of home working, relying on advanced communication systems and technology, would make visits to smaller head offices situated in the heart of town centres more acceptable.

Remember to base your answers only on the information given in the passage

Proximity to retail outlets is seen as an important issue when evaluating office locations ☐ True ☐ False ☐ Can't say

"appearance and spaciousness have failed to compensate for limited provision of basic infrastructure such as shops, banks and leisure facilities - true"

The continued popularity of business parks will be reinforced by new technology ☐ True ☐ False ☐ Can't say

"an expansion of home working, relying on advanced communication systems and technology, would make visits to smaller head offices situated in the heart of town centres more acceptable – false "

Cash flow is the main problem for speculative developers ☐ True ☐ False ☐ Can't say

Hard to know if cash flow is the MAIN problem – the text lists it as A problem "developers reneged on earlier promises or struggled with cash flow problems and other difficulties – can't say"

In certain instances, there have been discrepancies between the original plans and the finished business park ☐ True ☐ False ☐ Can't say

"as less scrupulous developers reneged on earlier promises - true"

MECHANICAL REASONING

Mechanical reasoning is utilised in aptitude tests for organisations like the military and fire brigade where there is some mechanical work required for many of the roles.
There are commonly four themes of questions:

1. **Vectors (force or movement with a direction component)**
2. **Levers**
3. **Gears**
4. **Pulleys**

Mechanical Reasoning: Mechanical Terms

The objective of mechanical reasoning is to determine the Mechanical Advantage of various mechanical systems, such as levers, gears and pulleys. Additionally, mechanical reasoning considers the direction of movement with an applied load in a given system.

Mechanical systems use the following terms and units

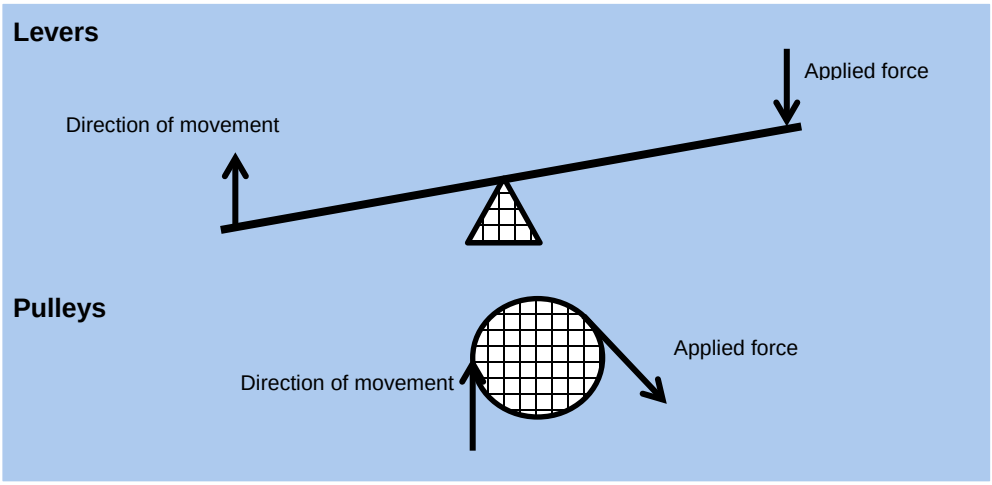
- F is force with units *(Newtons, N)*
- m is mass with units *(kilograms, kg)*
- a is acceleration with units *(m/s^2)*
- Energy is energy with units *(Joules, J)* [Potential Energy and Kinetic Energy]
- T is torque with units *(Newton metre, Nm)*
- D is distance with units *(metre, millimetre etc)*
- MA is Mechanical Advantage *(no units)*

Mechanical: Review Formulas

Mechanical Equilibrium	$Force_1 \times Distance_1 = Force_2 \times Distance_2$
Force	$Force = mass \times acceleration$ (common acceleration is gravity with a value of $10m/s^2$)
Mechanical Advantage (Levers)	$Mechanical\ Advantage = \frac{Load}{Effort}$
Mechanical Advantage (Pulleys)	$Mechanical\ Advantage = \frac{Wheel\ Radius}{Axle\ Radius}$
Mechanical Advantage (Ramps and Inclined Planes)	$Mechanical\ Advantage = \frac{Length\ of\ Slope}{Height\ of\ Slope}$
Mechanical Advantage (Gears)	$Mechanical\ Advantage = \frac{Number\ of\ Teeth\ (driver\ gear)}{Number\ of\ Teeth\ (driven\ gear)}$

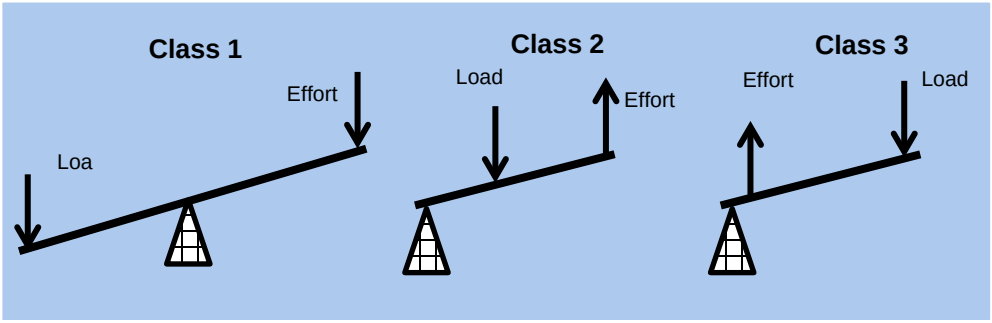
Mechanical: Review Vectors

Motion considers *Vector* quantities (size and direction) and *Scalar* quantities (size only)
Most aspects of mechanical movements are vectors because they change direction



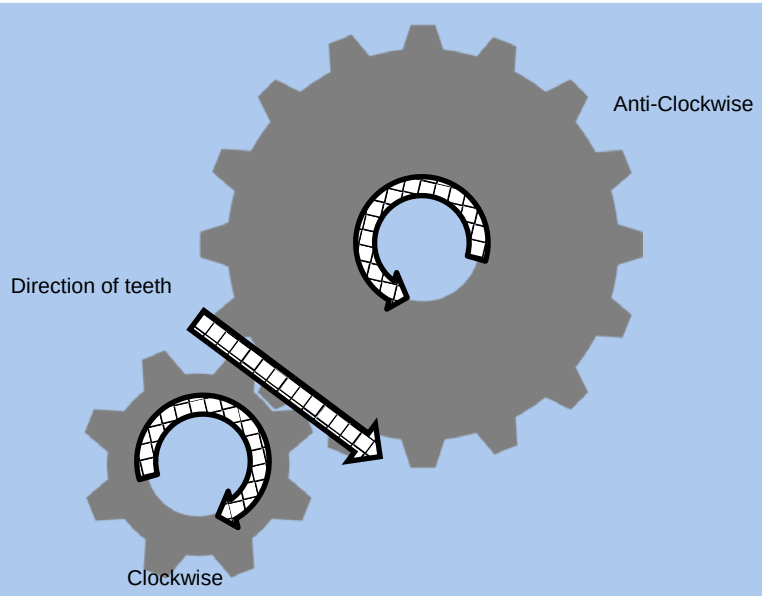
Mechanical: Levers

Levers have 3 parts: Fulcrum (the point of support), Load (weight or resistance), and Effort (applied force).
Levers fall into 3 classes: Class 1 changes the direction of the effort – Classes 2 and 3 do not change the direction of the applied force
The Mechanical Advantage is determined by the relative distance of the Load and the Effort from the Fulcrum



Mechanical: Gears

Gears change the direction of rotation because of the linear direction of the teeth when interacting This direction is 90^{o} to the line between shaft centres.
Direction is expressed in terms of clockwise and anti-clockwise (or counter-clockwise)



Speed meets mechanical equilibrium rule

$$speed_1 \times number\ of\ teeth_1 = speed_2 \times number\ of\ teeth_2$$

If driver gear is 20 teeth going at 40RPM (revolutions per minute) and driven gear is 40 teeth, then speed is 20RPM

Mechanical: Pulleys

A pulley is a rope, wheel and axle or combination of multiple similar parts
Pulleys fall into 3 types: single (fixed), movable and compound

1. **Single Pulley** – A single pulley changes the direction of effort, but has no Mechanical Advantage

2. **Movable Pulley** – A movable pulley uses 2 or more wheels and provides Mechanical Advantage by increasing the rope employed for the distance the load is moved

3. **Compound Pulley** – A compound pulley is a system of movable pulleys to change the direction of effort and provide a Mechanical Advantage.
   - A common compound pulley is a block and tackle
   - The Mechanical Advantage of a compound pulley can be determined by the number of ropes in the pulley system (excluding the rope that goes to the effort)

TEST STRATEGIES

CHAPTER SUMMARY

After completing this chapter, you should be able to

- Define a winning strategy to give you the best chance to successfully complete the test
- Break the strategy into bite-sized goals
- Understand what resources you have at hand and how to make best use of these
- Know how much practice to undertake, define what success looks like
- Know what steps to take to manage your time
- Give yourself honest feedback through a process to reflect on performance during a practice test

STRATEGY DEFINITION

Why include a section on strategy? Many times people have answered questions from the top, spent too long trying to answer questions they did not understand and then due to time constraints, rushed through final questions (that they would otherwise have done well with) and ultimately failed. Hardly an ideal outcome.

Defining a strategy of how you will undertake the test is important so that you can maximise the score you achieve and avoid the scenario outlined.

> **Strategy generally involves setting goals, determining actions to achieve the goals, and mobilizing resources to execute the actions. A strategy describes how the ends (goals) will be achieved by the means (resources).**

reference: wikipedia

GOAL SETTING

As part of strategy setting, you need to set your own goals. Goal consideration includes

1 **Time planning and management**

- Say – 50 questions in 20 mins
- 2.5 questions per minute
- 1 question every 24 seconds
- Do not assume you can answer from the top

2 **Question selection**

- Perform to the pass mark (you probably don't need to try to answer everything)
- Understand your topic knowledge – good, bad and ugly
- Don't waste time on ugly
- What mix of question themes in the test – numerical, diagrammatical, verbal and mechanical
- Get into a rhythm – what rhythm works for you

RESOURCES

As identified in the Strategy Definition, resources are consumed in reaching your goals. But what are your resources?

- Prior experience and practice
- Choice of questions
- Time is your most precious resource – don't waste it… how?

PRACTICE

How much do you need to practice? Consider

- How long since you did these types of questions?
- What was your previous level of proficiency?
- What does success mean to you?
- How badly do you want to pass?

TIME MANAGEMENT

Time management is critical to ensure that you can complete the whole test. Considerations include

- Know the time available to answer each question
- Answer questions in your head, don't work out on paper
- Perform to the pass mark
- Understand your topic understanding (good, bad or ugly questions) – don't waste time on ugly
- Get into a rhythm

TEST REFLECTION

Doing a self-reflection following the practice test is beneficial.
Ask yourself

- How do you feel about your performance?
- What did you think about the test instructions?
- What was your focus when doing the practice test?
- What could you do better next time?
- How do you feel about your improvement since your last practice test?
- What was your biggest weakness (time management/subject knowledge)?
- What was your focus during the practice test period?
- What do you need to focus on in the lead up to the real test?

STRESS MANAGEMENT

CHAPTER SUMMARY

After completing this chapter, you should be able to

- Know how to respond to the various stressors in life because you have done practice tests with these stressors
- Improve future performance through relaxation and other techniques
- Write an anxiety journal to reflect on your fears and how these are holding back your success

WHY PRACTICE WITH STRESS

Going into a test as important as this can be stressful. You have your own expectations, those of your family and friends, boss. You visualise your new career or opportunity, but your performance can all be impacted by:

- Cold/flu or other sickness
- Drugs
- Lack of sleep
- Stressors (such as missing bus or train, road rage, argument with significant other or anxiety/nervousness)

These performance issues can be minimised if you practice under stressful conditions.

> **We know from research on mastering skills or tasks, that practice (and a lot of it) is necessary. But, practicing under stress - even a moderate amount - helps a person feel comfortable when they find themselves standing in the line of fire, Beilock said. The experience of having dealt with stress makes those situations seem familiar, and not so daunting. The goal is to close the gap between practice and performance.**

reference: psychologytoday.com

TECHNIQUES TO IMPROVE PERFORMANCE

There are two primary methods to change your focus and improve performance. These are

1. **Method 1:** Get into a relaxing state of mind
2. **Method 2:** Write your fears in an Anxiety Journal

ANXIETY JOURNAL

What are your fears about the test?	
How would realisation of your fears impact you?	
What is the worst that can happen?	
What would you tell your future self?	

PRACTICE QUESTIONS

CHAPTER SUMMARY

After completing this chapter, you should be able to work through and apply the lessons from this book solving problems in

- Numerical reasoning
- Diagrammatical reasoning
- Verbal reasoning
- Mechanical reasoning

This set of 100 questions should take a well-prepared student a maximum of 40 minutes.

Q1. Michelle is undertaking the Victoria Police entry aptitude test. The test consists of 50 questions to be answered in 20 minutes. On average, how many seconds does Michelle have to answer each question?

Q2. Which two statements together PROVE that Ron is the most committed to his job?

A. People who work hard are satisfied with their job
B. People who are most satisfied are most committed to their jobs
C. Ron is the most satisfied person in the company
D. Ron works very hard
E. Ron enjoys working with his colleagues

Q3. Find the missing numbers in the following series

2 5 8 ? 14 17 ? 23

Q4. If Charlie has 28 chocolates and Matt has 6, how many chocolates must Charlie give Matt so that they have an equal number?

Q5. Which two of the five items do not belong with the others?

A 

B 

C 

D 

E 

Q6. Find the missing number identified by the X

169,13	49, 7	144, X	81, 9

Q7. A slab of beer was shared between four firemen while watching the footy. If the slab had 24 stubbies, the first fireman took ½ of the slab, the second fireman took ½ of what was left, the third fireman took ½ of what was left and the fourth fireman drank the remainder.

How many stubbies did each fireman drink?

First:_____ Second:_____ Third:_____ Fourth:_____

Q8. Barry, Jacinta, Anna and Jonny each have a jelly bean collection. A black jelly bean is worth 2 green jelly beans, yellow jelly beans are worth half of a red jelly bean. Black jelly beans will trade for 4 yellow jelly beans.

Anna wants to increase the number of black jelly beans in her jelly bean collection. Anna has the following jelly beans in her collection.

Black jelly beans	8
Green jelly beans	4
Yellow jelly beans	8
Red jelly beans	6

If Barry, Jacinta and Jonny want to trade their black jelly beans with Anna for her jelly beans of other colours, how many jelly beans will Anna have after the trade?

Q9. Rebecca must give 5 out of every 6 dollars she earns each week to the tax department. If Rebecca gets to keep $10 this week, how much did she earn in total this week?

Q10. Find the missing numbers in the following series

68 62 55 47 ? 28 17 ?

Q11. Samantha has a box of teddy bears, but she is not sure how many she has. If she arranges the teddy bears in groups of four, she has three left over. If she arranges them in groups of three, she has two left over and there are three left over when she puts them in groups of five. Samantha definitely doesn't have any more than 30 teddy bears, so how many does she have?

A	B	C	D	E
27	28	21	22	None of these

Q12. It takes 1.5 litres of red paint to paint a square metre of ceiling and 1.5 litres of blue paint to paint a square metre of wall. Bianca's room is 4 metres high and each wall is 5 metres wide. There is one window, which is $4m^2$ and a door, which is $9m^2$.
How much paint in total will Bianca need to buy from Bunnings, assuming she does not paint the door or window (a room has four walls and a ceiling)?

Q13. Which number should be in the square marked by the X?

2	4	8
4	8	-
8	16	X

Q14. Michelle came in from the kitchen carrying a cup of coffee at 100^oC. If Michelle's coffee loses 10% of its (with the temperature drop rounded down to the nearest degree) every minute, what temperature is it when Michelle drinks it 5 minutes later?

Q15. It costs a manufacturer X dollars per widget to make the first 100 widgets. Beyond a production run of 100 widgets, all widgets cost X/3. When X = $1.50, how much will it cost to manufacture 1,000 widgets?

Q16. Choose the answer from the list below which is the closest answer with a value above 95 + 87

A	B	C	D	E
145	185	181	204	172

Q17. Which number should be in the square marked by the X?

22	14	6
16	X	-
-	2	-6

Q18. Six whole consecutive numbers add up to a total of 99. What is the highest of these numbers?

Q19. What number when multiplied by itself is 19 greater than the preceding number when multiplied by itself?

Q20. **The following case study is relevant to questions Q20 through Q22 inclusive.**
John and Michelle go out for dinner with their friends Steve and Bianca. If each of them has a $28 main and a $12 dessert, they also shared two $20 bottles of house wine. How much does each couple owe?

Q21. The restaurant has a 15% surcharge for public holidays. How much does this increase the bill?

Q22. John and Michelle drive in John's car that uses 15litres/100km of petrol. If the round trip is 40km, how much petrol does the car use to drive home?

Q23. What is the missing number that should take the place of the question mark?

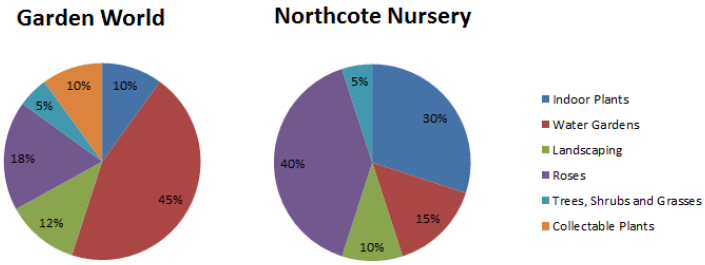
4 4 7 13 ? 34 49

Q24. Which number should be in the square marked by the X?

12	14	-
16	X	20
20	-	24

Q25. **The following case study is relevant to questions Q25 through Q31 inclusive.**

Jack owns two nurseries in Melbourne. His first nursery Garden World has total annual sales of $1,000 and Northcote Nursery has annual sales of $1,100.



How many more sales of Indoor Plants are there at Northcote Nursery than Garden World?

Q26. As a percentage, how much less total sales does Garden World do than Northcote Nursery?

7% 8% 9% 10% 11%

Q27. If Jack's profit margin is 40% of total sales and he pays a 30% tax rate, what is his tax obligation for his Garden World nursery?

Q28. What is the average sales value per product line for Northcote Nursery?

Q29. Jack wants to rationalise his business and eliminate his lowest-performing product line based on sales across his two stores. Which one would he choose?

A. Trees, Shrubs and Grasses
B. Collectable Plants
C. Roses
D. Water Gardens

Q30. Jack does a promotion of a single product line at either of his two stores. If the promotion results in an increase of 20% of sales for that line for the year, what is the maximum increase in revenues that Jack could achieve? Which product line would Jack focus his efforts on?

Q31. Jack uses business statistics as a scientific approach for decision-making in the face of risk and uncertainty. Statistical forecasting is used for forecasting sales and budgets.

Jack uses statistical forecasting based on past performance to identify trends, patterns and business drivers to forecast future purchases and sales revenues. This forecast is referred to as a statistical forecast because it uses mathematical formulas to identify patterns and trends while testing the results for mathematical reasonableness and confidence.

Jack is looking to start a nursery in Sydney and is looking to base his sales forecasts of individual plant categories on his current stores in Melbourne. Jack does not need to undertake any further work in addition to this case study– TRUE or FALSE?

Base your answer only on the information in the case study

A. TRUE, he can use the sales results for plant categories at Northcote Nursery
B. TRUE, he can use the sales results for plant categories at Garden World
C. TRUE, he can take an average of his two stores results for the plant categories
D. FALSE

Q32. Two trucks were driven on a 1,680km trip. The first truck averaged 14 km/litre of diesel for the trip, and the second averaged 12 km/litre. The second truck used how many more litres of diesel than the first?

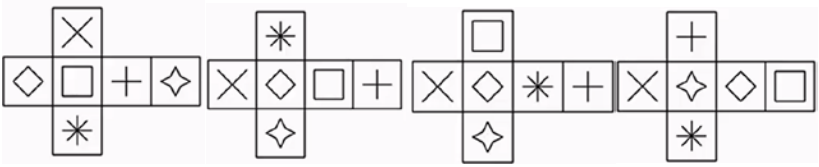
A. 10 litres
B. 20 litres
C. 30 litres
D. 40 litres
E. Cannot tell from the information given

Q33. 45% of 800 = ?

A	B	C	D	E
310	360	405	440	630

Q34.

A B C D



Q35. 24 skiers were skiing downhill with a ski pole in each hand. When they arrive back at the lodge, one half did not have 2 ski poles and half of this number only had 1 ski pole. How many ski poles were remaining when the group arrived back at the lodge?

Q36. A train travelling at 60kmh enters a tunnel that is 5km long. The train is 1km long. How many minutes does it take the whole train to pass through the tunnel?

A	B	C	D	E
7	4	10	5	6

Q37. 56 + 81 = 44 + ?

A	B	C	D	E
93	90	89	91	95

Q38. The number of apples bought at a shop was placed into 3 bags. The first bag when divided by 8, the second bag when divided by 5, and the third bag when divided by 3, resulted in the same whole number. What is the least number of apples that could have been bought?

Q39. Identify the missing number

7	4
5	6

49	16
25	?

A	B	C	D	E
41	36	35	18	37

Q40. Which 5 consecutive ODD numbers have a sum equal to 355?

Q41. Find the missing numbers in the following series

2 4 8 ? 32 64 ? 256

Q42. **The following case study is relevant to questions Q42 through Q45 inclusive.**

John is sitting on the couch eating peanuts out of the shell. The peanuts (including kernel and shell) weigh 2 grams each, with 60% of the weight in the kernel. If John ate the whole 250g packet of nuts, how much shell is left to put in the bin?

Q43. How many nuts were in the packet?

Q44. John got up from the 50kg couch to get the Tattslotto receipt from the fridge to check the numbers, leaving Michelle (who weighs 60kg) on the 4 footed couch. When John (who weighs 90kg) returns to sit down, how much weight (on average) does each foot of the couch carry?

Q45. John and Michelle always play the same 8 Tattslotto numbers (between 1 and 45), using a consistent formula. What are their missing numbers (marked with X and Y)

6, 36	3, 9	5, X	Y, 16

Q46. Audrey donates give 10% of her pension to her local church. If she donated $104 in the last month, what is her weekly pension?

Q47. The words MIGHT and POWER

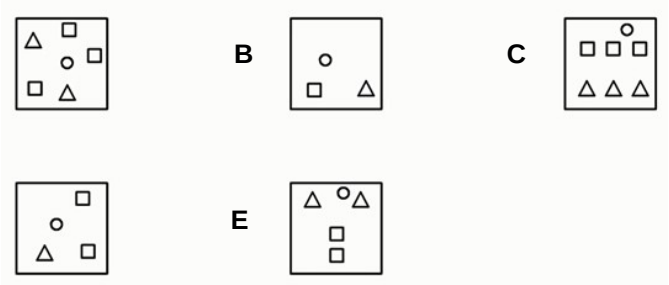
A. Have the opposite meaning
B. Have neither similar nor opposite meaning
C. Have a similar meaning

Q48. What is 15 x 15?

Q49. If a driver gear of 40 teeth going at 20RPM clockwise is driving a driven gear of 20 teeth, what speed and direction is the driven gear going at?

A. 40RPM, clockwise
B. 20RPM, anticlockwise
C. 40RPM, anticlockwise
D. 80RPM, clockwise
E. 80RPM, anticlockwise

Q50. Which two of the five items do not belong with the others?



Q51. George sold 40 coffees in the morning rush. Quarter of all the coffees had soy, while half of all the coffees were latte. What is the largest number of coffees that could have been soy lattes?

Q52. Suzie and Justin have rented a van from Wicked Campers to go on a road trip. They are going to be away for 3 weeks and plan to drive from Melbourne to Perth return with sightseeing. The total distance they will drive is 8,200 km. If Wicked Campers include 200km per day and charge 20c per km extra, how much extra mileage charge do Suzie and Justin owe?

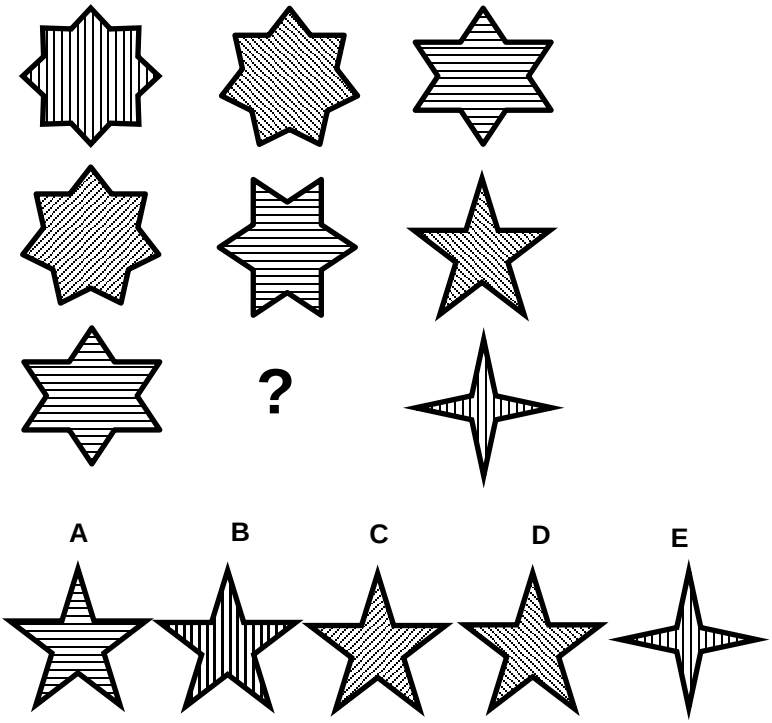
A. $80
B. $180
C. $800
D. $8,000
E. Can't tell from the information provided

Q53. 88 – 21 = 44 + ?

A	B	C	D	E
13	27	23	67	9

Q54. 20 friends go out to the movies and shop at the candy bar when buying the tickets. Half of the group bought popcorn and drink; a quarter bought popcorn, drink and ice- cream and the remainder only bought popcorn. How many items did the group buy?

Q55. Which shape belongs at ?



Q56. Identify the missing number

18	72
30	120

3	12
5	?

A	B	C	D	E
18	36	20	22	14

Q57. Lindy wanted to buy chocolate bars for her friends at school. Sarah wanted the number to be a multiple of 6, Emily wanted the number to be a multiple of 3, Janet wanted the number to be a multiple of 4 and Fiona wanted the number to be a multiple of 2. Lindy bought enough chocolate bars to satisfy her friend's requests. How many did she buy?

Q58. Four of the following are alike in some way. Please select the other two.

A. Kid
B. Foal
C. Stallion
D. Ewe
E. Lamb
F. Joey

Q59. What digit is missing from the following sum?

	6	3	?
+	?	8	8
	9	?	0

Q60. An on-time bus travelling at 100kmh encounters road works that slow it down to 40kmh. The road works are 10km long. If these road works are the only delay for the bus trip, how many minutes late will the bus be arriving at the destination?

A	B	C	D	E
13	27	23	67	9

Q61. What number when multiplied by itself is 44 greater than the preceding EVEN number when multiplied by itself?

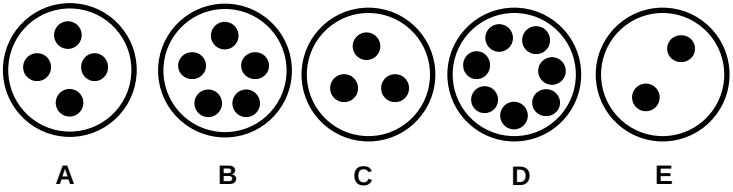
Q62. Which number should be in the square marked by the X?

15	-	35
8	X	-
1	11	-

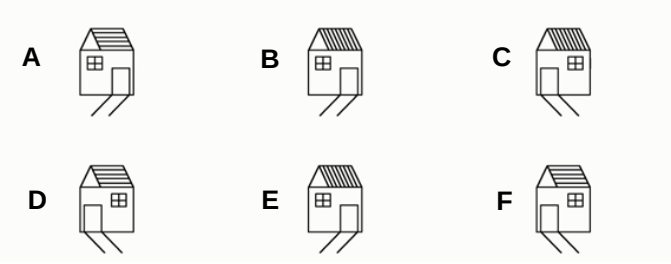
Q63. Choose the answer from the list below which is the closest value to 5^4

A	B	C	D	E
5	20	5000	1.25	500

Q64. Which two of the following five items do not belong with the others?



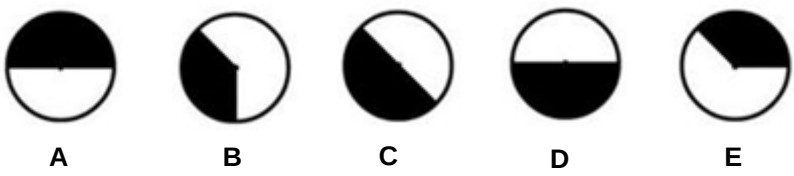
Q65. Which two of the six items do not belong with the others?



Q66. What is 1218 divided by 14?

Q67. We have the following series

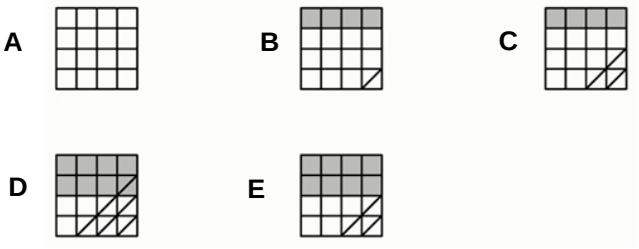
What is the next shape in the series



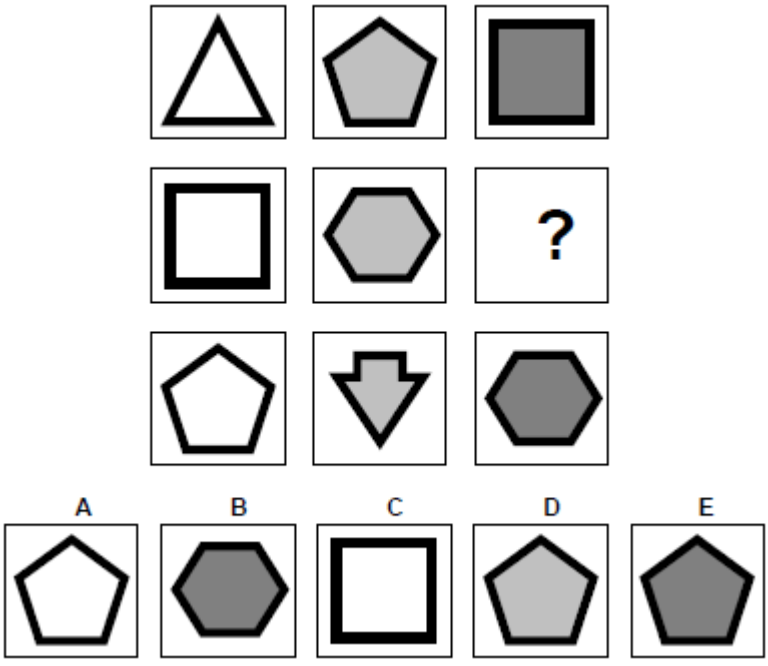
Q68. The words DETAILED and THOROUGH

A. Have the opposite meaning
B. Have neither similar nor opposite meaning
C. Have a similar meaning

Q69. Which two of the five items do not belong with the others?

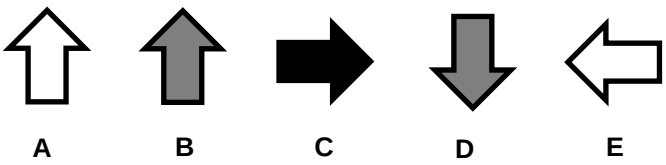


Q70. What is shape belongs at ?



Q71. If we have a pattern like the following, what is next?

Identify the next shape in the series



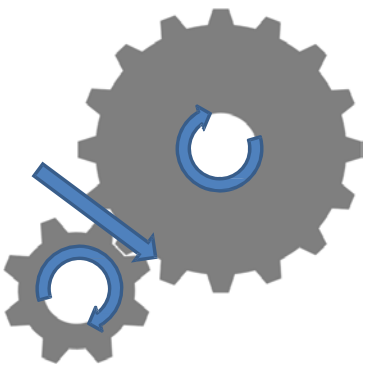
Q72. There are five Mondays in a certain month. Of three of the Mondays occur on even days, which day of the week is the 11th day of the month?

Q73. Jack is using a block and tackle to lift a 240kg load into his ute. If the MA of this compound pulley is 8, how much effort does Jack need to exert to lift the load?

Q74. Four of the following are alike in some way. Please select the other two.

A. Coffee
B. Black
C. Carrot
D. Chocolate
E. Soy
F. Pumpkin

Q75. What is wrong with this picture?



Q76. CLASS is to TEACHER as TOUR is to

A. Tourist
B. Tour Bus
C. Tour Guide
D. Destination
E. Itinerary

Q77. Which two statements together PROVE that Megan has brown hair?

A. The only hair colour that Jane likes is brown
B. Megan's hair is not blonde
C. Jane has long hair
D. Megan likes long hair
E. Jane likes the colour of Megan's hair

Q78. Four of the following are alike in some way. Please select the other two.

A. Car
B. Boat
C. Bus
D. Run
E. Train
F. Walk

Q79. CAR is to IGNITION as TORCH is to

A. Battery
B. Light
C. Glovebox
D. Power
E. Switch

Q80. Logic-based reasoning:
Purchasing can have a significant effect on an organization's total profit. However, the success of a purchasing function relies on competent buyers and a purchasing manager who employs systematic purchasing methods and implements technological advances. If an organization's profitability is in jeopardy, the efficiency and skill of its purchasing function may determine whether it operates at a profit or at a loss. As such, the purchasing function bears a significant amount of the responsibility for an organization's profit, and, whenever an organization strives to produce a profit, it will expend the effort required to hire capable and qualified buyers as well as a knowledgeable, intelligent purchasing manager.
From the information given above, it can be validly concluded that:

A. If an organization's profitability is not in jeopardy then the competence of its purchasing function will not determine whether it operates at a profit or at a loss.
B. There are at least some purchasing functions that are not responsible for a significant amount of an organization's profit.
C. A non-purchasing function will not bear significant responsibility for the profit of an organization.
D. An organization whose profitability is in jeopardy may depend on the efficiency and skill of its purchasing function to determine whether it operates at a profit or at a loss.

Q81. POLITICIANS is to GOVERNMENT as SINGERS is to

A. Ballad
B. Choir
C. Composition
D. Music
E. Song

Q82. Four of the following are alike in some way. Please select the other two.

A. Float
B. Hover
C. Fall
D. Glide
E. Sink
F. Drift

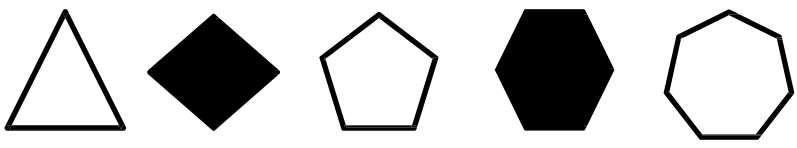
Q83. Which two of the following five items do not belong with the others?

A **B** **C** **D** **E**

Q84. Identify the correct use of words.

"Look over [there/they're/their]", said Lucy pointing at the ducks. "The cat is eating [there/they're/their] eggs and now [there/they're/their] all upset".

Q85. Which two of the five items do not belong with the others?



A **B** **C** **D** **E**

Q86. PIZZA OVEN is to DOUGH as TOASTER is to

A. Toast
B. Vegemite
C. Bread
D. Breakfast
E. Hair

Q87. 55% of 500?

A	B	C	D	E
250	275	257	300	285

Q88. What is the missing number that should take the place of the question mark?

8 8 13 23 ? 58 83

Q89. **The following case study is relevant to questions Q89 through Q91 inclusive.**

John and Michelle go out again for dinner with their friends Steve and Bianca to celebrate John winning $1250 in division 6. Each of them has a $28 main and a $12 dessert, they also shared two $20 bottles of house wine and a $50 bottle of champagne. How much of the Tattslotto money does John have after paying for dinner?

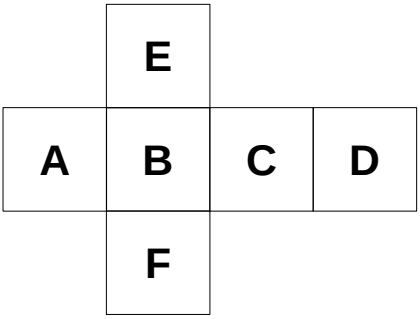
Q90. Steve convinces John to loan him $400 of the prize to put gas into his car, with the promise of 15% interest. How much interest will Steve pay to John?

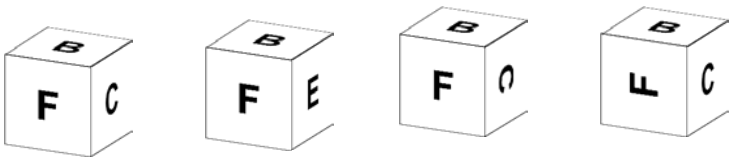
Q91. Steve gets his car fixed and the total cost he has to pay the mechanic for the gas conversion is $720. If Steve saves $20 per week in fuel costs, how long does it take for the gas conversion to pay for itself (including interest to John)?

Q92. Four of the following are alike in some way, select the other two.

A. Sheep
B. Cows
C. Deer
D. Elephants
E. People
F. Pigs

Q93. Which cube does the following shape make?





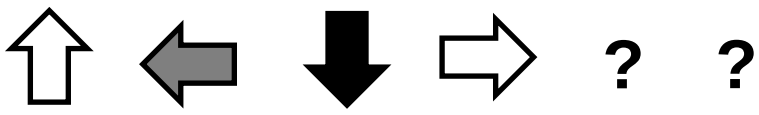
A B C D

Q94. Ben writes an ebook and sells it on Amazon for $30 each. Amazon charges a fee of 30% per sale. Ben wants to increase sales so offers a 1/3 off discount for a limited time only. How much less per ebook does Ben make when discounted compared to before the discount?

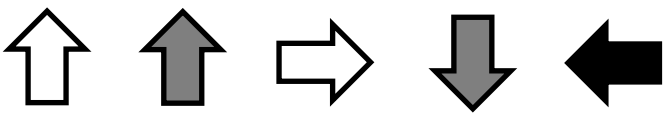
Q95. VOLUME is to WATER as DISTANCE is to

A. Flour
B. Cows
C. Road Trip
D. Time
E. Memory

Q96. If we have a pattern like the following, what is the second item missing?



Identify the next shape in the series



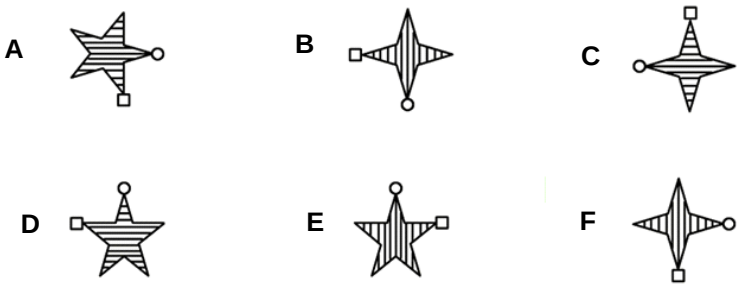
A B C D E

Q97. It costs Ruby's Garden Ornaments $3 dollars per gnome to make the first 500 gnomes. For a production run of between 501 and 1000 gnomes, all gnomes cost half the amount. Beyond 1000 gnomes, the production cost is $1 per gnome. How much will it cost to manufacture 1,500 gnomes?

Q98. Identify the correct spelling for each word

experiance	experience	experiense
perseverance	perseverence	persaverance
acomodate	accomodate	accommodate

Q99. Which two of the six items do not belong with the others?



Q100. Find the missing numbers in the following series

68 67 65 61 ? 37 ?

WORKED SOLUTIONS

A1. Michelle is undertaking the Victoria Police entry aptitude test. The test consists of 50 questions to be answered in 20 minutes. On average, how many seconds does Michelle have to answer each question?

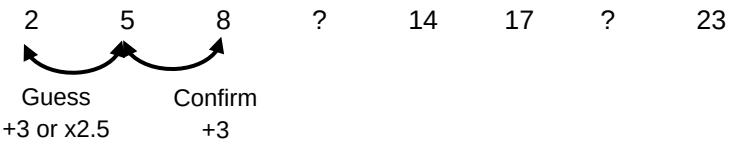
Solution: The question asked for the answer to be in seconds. Convert the inputs to seconds. 20 minutes x 60 seconds per minute = 1,200 seconds total time. 1,200 seconds / 50 questions = 24 seconds each question.

A2. **Which two statements together PROVE that Ron is the most committed to his job?**

A. People who work hard are satisfied with their job
B. People who are most satisfied are most committed to their jobs
C. Ron is the most satisfied person in the company
D. Ron works very hard
E. Ron enjoys working with his colleagues

Solution: Item B identifies that "People who are most satisfied are most committed to their jobs" and item C identifies that "Ron is the most satisfied person in the company".

A3. Find the missing numbers in the following series



Solution: Confirm the difference between the numbers is +3. So first missing number is 8 + 3 = 11, confirmed with 11 + 3 = 14. Second missing number is 17 + 3 = 20, confirmed with 20 + 3 = 23.

A4. If Charlie has 28 chocolates and Matt has 6, how many chocolates must Charlie give Matt so that they have an equal number?

Solution: There are a total of 28 + 6 = 34 chocolates to be shared between Charlie and Matt. They should each end up with 34 / 2 = 17 chocolates. So Charlie needs to give 28 – 17 = 11 chocolates to Matt so that he also has 6 + 11 = 17 chocolates.

A5. Which two of the five items do not belong with the others?

A  B  C 

D  E 

Solution: Identify the characteristics of each of the images. They each have legs, eyes and ears. As each has 2 ears, this can be eliminated. A has 1 eye and 2 legs / B has 3 eyes and 4 legs / C has 3 eyes and 3 legs / D has 2 eyes and 4 legs / E has 2 eyes and 3 legs
So items A, B and E have 1 more leg than eyes, so the items that do not belong are C and D

A6. Find the missing number identified by the X

169,13	49, 7	144, X	81, 9
Guess (right to left) x13, 13^2 or +156	Confirm 7^2		

Solution: In the first box, there are 3 options for the relationship between the right and left number (simply going this way as it is easier to multiply than divide). The second box confirms that the number on the left is the number on the right squared (x itself). Times tables 12 x 12 = 144.

A7. A slab of beer was shared between four firemen while watching the footy. If the slab had 24 stubbies, the first fireman took ½ of the slab, the second fireman took ½ of what was left, the third fireman took ½ of what was left and the fourth fireman drank the remainder.

How many stubbies did each fireman drink?

First:_____ Second:_____ Third:_____ Fourth:_____

Solution: The first fireman took half the beers ½ x 24 = 12 (so 24 – 12 = 12 left), the second took half of what was left ½ x 12 = 6 (so 12- 6 = 6 left), the third took half of what was left ½ x 6 = 3 (so 6 – 3 = 3 left) and the fourth drank the 3 left.

A8. Barry, Jacinta, Anna and Jonny each have a jelly bean collection. A black jelly bean is worth 2 green jelly beans, yellow jelly beans are worth half of a red jelly bean. Black jelly beans will trade for 4 yellow jelly beans.

Anna wants to increase the number of black jelly beans in her jelly bean collection. Anna has the following jelly beans in her collection.

Black jelly beans	8
Green jelly beans	4
Yellow jelly beans	8
Red jelly beans	6

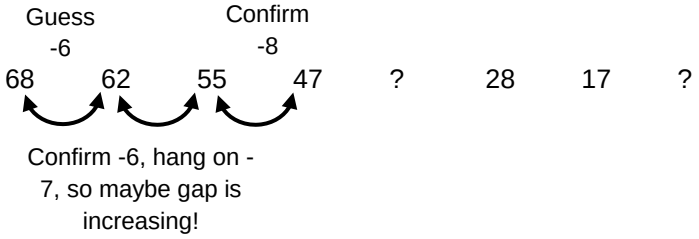
If Barry, Jacinta and Jonny want to trade their black jelly beans with Anna for her jelly beans of other colours, how many jelly beans will Anna have after the trade?

Solution: Calculate the equivalent value of all the jelly beans in terms of black jelly beans. 1 black = 2 green. 1 black = 4 yellow. Red jelly beans are worth twice as much as yellow jelly beans (restatement of yellow jelly beans are worth half as much as red), 1 black = 2 red. To sum up the black equivalent 8 black + 2 black (4 green) + 2 black (8 yellow) + 3 black (6 red) = 15 black jelly beans after the trade.

A9. Rebecca must give 5 out of every 6 dollars she earns each week to the tax department. If Rebecca gets to keep $10 this week, how much did she earn in total this week?

Solution: Rebecca gives $5 out of every $6 she earns, so keeps $6 – $5 = $1 out of $6. She keeps $10 (10 x $1 = $10), so she earned 10 x $6 = $60 this week.

A10. Find the missing numbers in the following series



Solution: Guess the gap between the first 2 numbers (-6) and then confirm or deny with the gap between the 2nd and 3rd numbers (-7). Appears the gap is increasing each step, -6, -7, -8, -9, -10, -11, -12. Confirm this with the gap between the 3rd and 4th numbers. So first missing number if 47 – 9 = 38, confirmed with 38 – 10 = 28. Second missing number 17 – 12 = 5.

A11. Samantha has a box of teddy bears, but she is not sure how many she has. If she arranges the teddy bears in groups of four, she has three left over. If she arranges them in groups of three, she has two left over and there are three left over when she puts them in groups of five. Samantha definitely doesn't have any more than 30 teddy bears, so how many does she have?

A	B	C	D	E
27	28	21	22	None of these

Solution: This is best solved using trial and error. Calculate groups of 3, 4 and 5 and determine the common result.

Groups of 3	*Groups of 4*	*Groups of 5*
2 x 3 + 2 = 8	*2 x 4 + 3 = 11*	*2 x 5 + 3 = 13*
3 x 3 + 2 = 11	*3 x 4 + 3 = 15*	*3 x 5 + 3 = 18*
4 x 3 + 2 = 14	*4 x 4 + 3 = 19*	***4 x 5 + 3 = 23***
5 x 3 + 2 = 17	***5 x 4 + 3 = 23***	*5 x 5 + 3 = 28*
6 x 3 + 2 =20	*6 x 4 + 3 = 27*	*6 x 5 + 3 = 33 (above 30)*
7 x 3 + 2 = 23	*7 x 4 + 3 = 31 (above 30)*	
8 x 3 + 2 = 26		
9 x 3 + 2 = 29		

As calculated above, 23 is the meets all of the criteria, so the answer is (E) none of these

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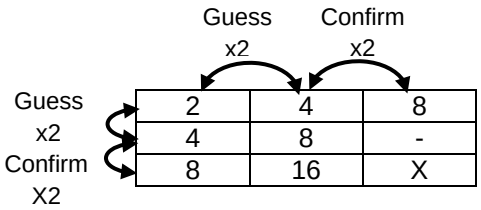
A12. It takes 1.5 litres of red paint to paint a square metre of ceiling and 1.5 litres of blue paint to paint a square metre of wall. Bianca's room is 4 metres high and each wall is 5 metres wide. There is one window, which is $4m^2$ and a door, which is $9m^2$.
How much paint in total will Bianca need to buy from Bunnings, assuming she does not paint the door or window (a room has four walls and a ceiling)?

Solution: wall area = 4m x 5m = $20m^2$ each wall x 4 walls = $80m^2$
Wall area net of door and window = $80m^2$ – (window $4m^2$ + door $9m^2$) = $80m^2$ – $13m^2$ = $67m^2$. Ceiling area = 5m x 5m = $25m^2$.
Total area = $67m^2$ + $25m^2$ = $92m^2$. Total Paint = $92m^2$ x 1.5ltr/m^2 = 138ltr

A13. Which number should be in the square marked by the X?



Solution: Confirm the difference between the columns is doubling the value to the left and the difference between the rows is doubling the row above. So moving across the columns X = 16x2 = 32 and confirm this moving down rows 8x2 = 16 (to replace the -), then 16x2 = 32

A14. Michelle came in from the kitchen carrying a cup of coffee at 100^oC. If Michelle's coffee loses 10% of its temperature (with the temperature drop rounded down to the nearest degree) every minute, what temperature is it when Michelle drinks it 5 minutes later?

Solution: Temperature at the start = 100^oC. After 1 minute = 100 – 10 = 90^oC. After 2 mins = 90 – 9 = 81^oC. After 3 mins = 81 – 8.1 = 81 - 8 = 73^oC. After 4 mins = 73 – 7.3 = 73 – 7 = 66^oC. After 5 mins = 66 – 6.6 = 66 - 6 = 60^oC

A15. It costs a manufacturer X dollars per widget to make the first 100 widgets. Beyond a production run of 100 widgets, all widgets cost X/3. When X = $1.50, how much will it cost to manufacture 1,000 widgets?

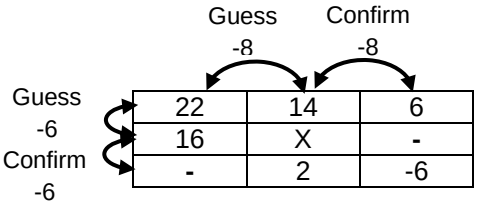
Solution: Manufacturing cost of 100 widgets = $1.50 each, so 100 x $1.50 = $150. Manufacturing cost of the next 900 widgets = $1.50/3 each = $0.50 each, so 900 x $0.50 = $450. So for a production run of 1,000 widgets the total cost will be = $150 + $450 = $600

A16. Choose the answer from the list below which is the closest answer with a value above 95 + 87

A	B	C	D	E
145	185	181	204	172

Solution: 95 + 87 = 90 + 80 + 5 + 7 = 182. Question asks for closest answer with a value ABOVE 182. Answer is B, 185.

A17. Which number should be in the square marked by the X?



Solution: Confirm the difference between the columns is -8 and the difference between the rows -6. So moving across the columns X = 16-8 = 8 and confirm this moving down rows 14-6 = 8

A18. Six consecutive whole numbers add up to a total of 99. What is the highest of these numbers?

Solution: Start by calculating the mid-point of the 6 numbers = 99/6 = 16.5. There are then 3 numbers larger and 3 numbers smaller than this mid-point - numbers are (smaller) 14, 15, 16, and (larger) 17, 18 and 19. The question asks for the highest which is 19.

A19. What number when multiplied by itself is 19 greater than the preceding number when multiplied by itself?

Solution: Use trial and error to find solution. 10 x 10 = 100, 9 x 9 = 81, so difference is 19. Quick tip 10 + 9 = 19.

A20. **The following case study is relevant to questions 23 through 25 inclusive.**
John and Michelle go out for dinner with their friends Steve and Bianca. If each of them has a $28 main and a $12 dessert, they also shared two $20 bottles of house wine. How much does each couple owe?

Solution: The total bill = 4 x ($28 + $12) + 2 x $20 = $200 So each couple owes $200/2 = $100

A21. The restaurant has a 15% surcharge for public holidays. How much does this increase the bill?

Solution: The surcharge increases the bill by 15%, so the increase is $200 x 15% = $30

A22. John and Michelle drive in John's car that uses 15litres/100km of petrol. If the round trip is 40km, how much petrol does the car use to drive home?

Solution: The drive home is half the round trip = ½ x 40km = 20km. Petrol used = 15litres/100km x 20km = 0.15 x 20 = 3 litres

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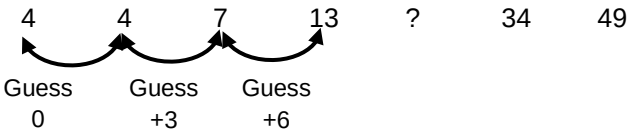
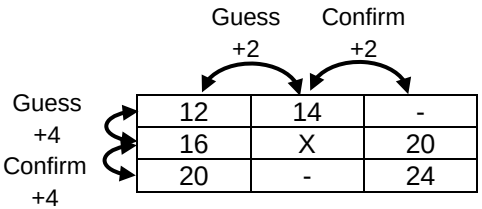
A23. What is the missing number that should take the place of the question mark?



Solution: Guess that the trend difference is increasing by 3 from the previous number: 0, 3, 6, 9, 12, 15. So guess 13+9 = 22 and confirm 22+12 = 34. So ? is 22.

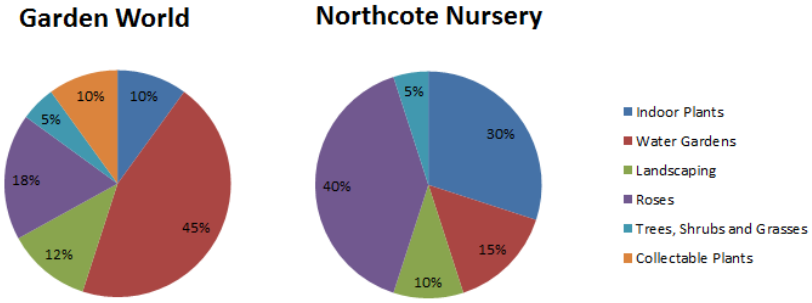
A24. Which number should be in the square marked by the X?



Solution: Confirm the difference between the columns is +2 and the difference between the rows is +4. So on middle row X = 14+4 = 18 and confirm this with 16+2 = 18

A25. **The following case study is relevant to questions Q25 through Q31 inclusive.**

Jack owns two nurseries in Melbourne. His first nursery Garden World has total annual sales of $1,000 and Northcote Nursery has annual sales of $1,100.



How many more sales of Indoor Plants are there at Northcote Nursery than Garden World?

Solution: Indoor Plants at Garden World = 10% x $1,000 = $100, Indoor Plants at Northcote Nursery = 30% x $1,100 = $330. So Northcote Nursery sales are $330 - $100 = $230 more.

A26. As a percentage, how much less total sales does Garden World do than Northcote Nursery?

7% 8% 9% 10% 11%

Solution: (Sales at Northcote Nursery – Sales at Garden World) / Sales at Northcote Nursery = (1,000 – 1,100)/1,100 = -100/1,100 = -9.1%

A27. If Jack's profit margin is 40% of total sales and he pays a 30% tax rate, what is his tax obligation for his Garden World nursery?

Solution: Profit = $1,000 x 40% = $400, tax on profit = 30% x $400 = $120

A28. What is the average sales value per product line for Northcote Nursery?

Solution: 5 product lines, $1,100 sales = $1,100/5 = $220 on average

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A29. Jack wants to rationalise his business and eliminate his lowest-performing product line based on sales across his two stores. Which one would he choose?

A. Trees, Shrubs and Grasses
B. Collectable Plants
C. Roses
D. Water Gardens

Solution: Collectable Plants has his total sales is only $100 in a single store, the lowest sales rate.

A30. Jack does a promotion of a single product line at either of his two stores. If the promotion results in an increase of 20% of sales for that line for the year, what is the maximum increase in revenues that Jack could achieve? Which product line would Jack focus his efforts on?

Solution: Water Gardens at Garden World. Current sales revenue = 45% x $1,000 = $450, increase in sales = 20% x $450 = $90

A31. Jack uses business statistics as a scientific approach for decision-making in the face of risk and uncertainty. Statistical forecasting is used for forecasting sales and budgets.

Jack uses statistical forecasting based on past performance to identify trends, patterns and business drivers to forecast future purchases and sales revenues. This forecast is referred to as a statistical forecast because it uses mathematical formulas to identify patterns and trends while testing the results for mathematical reasonableness and confidence.

Jack is looking to start a nursery in Sydney and is looking to base his sales forecasts of individual plant categories on his current stores in Melbourne. Jack does not need to undertake any further work in addition to this case study– TRUE or FALSE?

Base your answer only on the information in the case study

A. TRUE, he can use the sales results for plant categories at Northcote Nursery
B. TRUE, he can use the sales results for plant categories at Garden World
C. TRUE, he can take an average of his two stores results for the plant categories
D. FALSE

Solution: Jack does need to do undertake market research – he only has Melbourne stores and is opening in Sydney. So the answer is false.

A32. Two trucks were driven on a 1,680km trip. The first truck averaged 14 km/litre of diesel for the trip, and the second averaged 12 km/litre. The second truck used how many more litres of diesel than the first?

A. 10 litres
B. 20 litres
C. 30 litres
D. 40 litres
E. Cannot tell from the information given

Solution: Use anchor numbers of 12 and 14. Truck 1 = 1,680(km)/14(km/litre) = 1400/14+280/14 = 100+20 = 120litres used. Truck 2 = 1,680(km)/12(km/litres) = 1200/12+480/12 = 100+40 = 140litres used. Second truck used 140litres – 120litres = 20litres more.

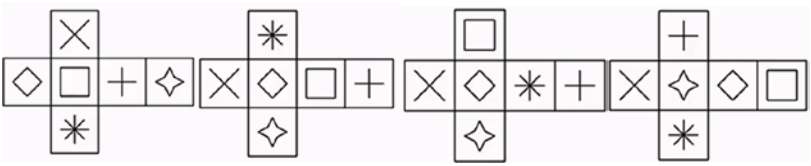
A33. 45% of 800 = ?

A	B	C	D	E
310	360	405	440	630

Solution: 10% of 800 is 80, so 50% of 800 is 400. 5% of 800 is half of 10%, so is 40. So 45% of 800 is 400-40 = 360. Correct answer is B.

A34.

A B C D



Solution: Recall that faces on opposite sides are 2 squares away from each other – so using this approach, eliminate A (and x are opposite faces), eliminate B (star and * are opposite) and eliminate C (x and * are opposite). D is the correct answer (all the others are eliminated).*

A35. 24 skiers were skiing downhill with a ski pole in each hand. When they arrive back at the lodge, one half did not have 2 ski poles and half of this number only had 1 ski pole. How many ski poles were remaining when the group arrived back at the lodge?

Solution: 12 (½ x 24) skiers had 2 poles + 6 (½ x ½ x 24) had 1 pole + 6 (½ x ½ x 24) had no poles. So 12 x 2 + 6 x 1 = 30 poles total.

A36. A train travelling at 60kmh enters a tunnel that is 5km long. The train is 1km long. How many minutes does it take the whole train to pass through the tunnel?

A	B	C	D	E
7	4	10	5	6

Solution: The distance the train needs to travel to be clear of the tunnel is 5km (tunnel length) + 1km (train length) = 6km. Travelling at 60km/hr, travel time is 6/60 = 1/10 of an hour = 6 minutes

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A37. 56 + 81 = 44 + ?

A	B	C	D	E
93	90	89	91	95

Solution: 56 + 81 = 137. 137 – 44 = 93. So 56 + 81 = 137 = 44 + 93. Answer is A

A38. The number of apples bought at a shop was placed into 3 bags. The first bag when divided by 8, the second bag when divided by 5, and the third bag when divided by 3, resulted in the same whole number. What is the least number of apples that could have been bought?

Solution: Start by assuming that the same whole number is 1 – the smallest whole number. Therefore the first bag = 8, second bag = 5, third bag = 3. Total apples = 16.

A39. Identify the missing number

7	4
5	6

49	16
25	?

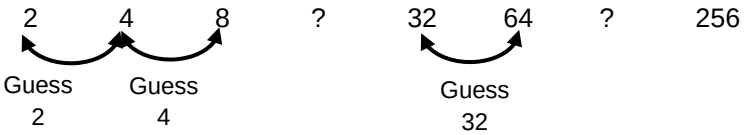
A	B	C	D	E
41	36	35	18	37

Solution: Determine the relationships between the matrix on the left and that on the right. Determining the relationship between the left and right 49/7 = 7, 16/4 = 4, so right values are the value on the left squared. Using this logic, 6^2 = 36, so the answer is B.

A40. Which 5 consecutive ODD numbers have a sum equal to 355?

Solution: Start by calculating the mid-point of the 5 numbers = 355/5 = 71. The 5 numbers are then this mid-point as well as the 2 numbers larger and 2 numbers smaller - numbers are 67, 69, 71, 73 and 75.

A41. Find the missing numbers in the following series



Solution: Guess that the trend difference is doubling from the previous number: 2, 4, 8, 16, 32, 64, 128. For the first ?, guess 8+8 = 16 and confirm 16+16 = 32. So the first ? is 16. For the second ?, guess 64+64 = 128 and confirm 128+128 = 256. So the second ? is 128.

A42. **The following case study is relevant to questions Q42 through Q45 inclusive.**

John is sitting on the couch eating peanuts out of the shell. The peanuts (including kernel and shell) weigh 2 grams each, with 60% of the weight in the kernel. If John ate the whole 250g packet of nuts, how much shell is left to put in the bin?

Solution: Peanut shell weight is 100%-60% = 40% of the total peanut weight. The packet is 250g, so the weight of the shell = 40% x 250g = 100g

A43. How many nuts were in the packet?

Solution: The 250g packet had 2g nuts in it. So 250g/2g = 125 nuts

A44. John got up from the 50kg couch to get the Tattslotto receipt from the fridge to check the numbers, leaving Michelle (who weighs 60kg) on the 4 footed couch. When John (who weighs 90kg) returns to sit down, how much weight (on average) does each foot of the couch carry?

Solution: The total load on the coach feet is 50kg + 60kg + 90kg = 200kg total. The load per foot is 200 / 4 = 50kg per foot

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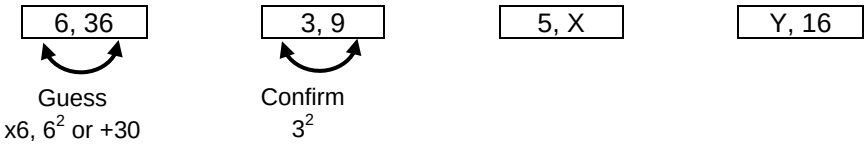
A45. John and Michelle always play the same 8 Tattslotto numbers (between 1 and 45), using a consistent formula. What are their missing numbers (marked with X and Y)



Solution: In the first box, there are 3 options for the relationship between the left and right number – these are (i) 6x6=36, 6^2=36 or 6+30=36. The second box confirms that the number on the right is the number on the left squared (x itself). So using the confirmed calculation the third box is 5^2=25 and the fourth box is 4^2=16.

A46. Audrey donates give 10% of her pension to her local church. If she donated $104 in the last month, what is her weekly pension?

Solution: Simplify the question by assuming 4 weeks in a month. Audrey's donation is $104/4 = $26 per week. We know 10% is 1/10, so reversing this, Audrey's total pension is calculated as $26 x 10 = $260 per week

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A47. The words MIGHT and POWER

A. Have the opposite meaning
B. Have neither similar nor opposite meaning
C. Have a similar meaning

Solution: The words might and power have similar meanings

A48. What is 15 x 15?

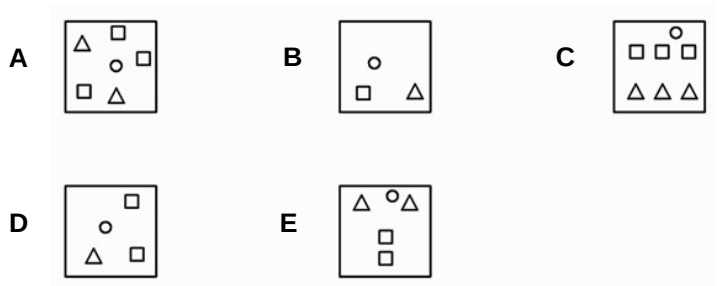
Solution: 15 x 15 = 15 x (10 + 5) = 15 x 10 + 15 x 5 = 150 + 75 = 225

A49. If a driver gear of 40 teeth going at 20RPM clockwise is driving a driven gear of 20 teeth, what speed and direction is the driven gear going at?

A. 40RPM, clockwise
B. 20RPM, anticlockwise
C. 40RPM, anticlockwise
D. 80RPM, clockwise
E. 80RPM, anticlockwise

Solution: remember the formula speed$_1$ x number of teeth$_1$ = formula speed$_2$ x number of teeth$_2$
Gear 1 speed x number of teeth = 20 x 40 = 800
Gear 2 speed x number of teeth = 800 = ? x 20, so speed = 40RPM
Direction is opposite (anti-clockwise), so answer is C

A50. Which two of the five items do not belong with the others?



Solution: Identify the characteristics of each image. They comprise 1 or more squares, 1 or more triangles and a circle. Items B, C and E have equal numbers of squares and triangles. Items A and D do not, so they do not belong

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A51. George sold 40 coffees in the morning rush. Quarter of all the coffees had soy, while half of all the coffees were latte. What is the largest number of coffees that could have been soy lattes?

Solution: All soy drinks may be latte, so ¼ of the total coffees = 10

A52. Suzie and Justin have rented a van from Wicked Campers to go on a road trip. They are going to be away for 3 weeks and plan to drive from Melbourne to Perth return with sightseeing. The total distance they will drive is 8,200 km. If Wicked Campers include 200km per day and charge 20c per km extra, how much extra mileage charge do Suzie and Justin owe?

A. $80
B. $180
C. $800
D. $8,000
E. Can't tell from the information provided

Solution: Suzie and Justin have 3 x 7 x 200 = 4200 km included. They will pay extra mileage on 8200 – 4200 = 4000km. 4000km x 0.20 = $800, so answer is C

A53. 88 – 21 = 44 + ?

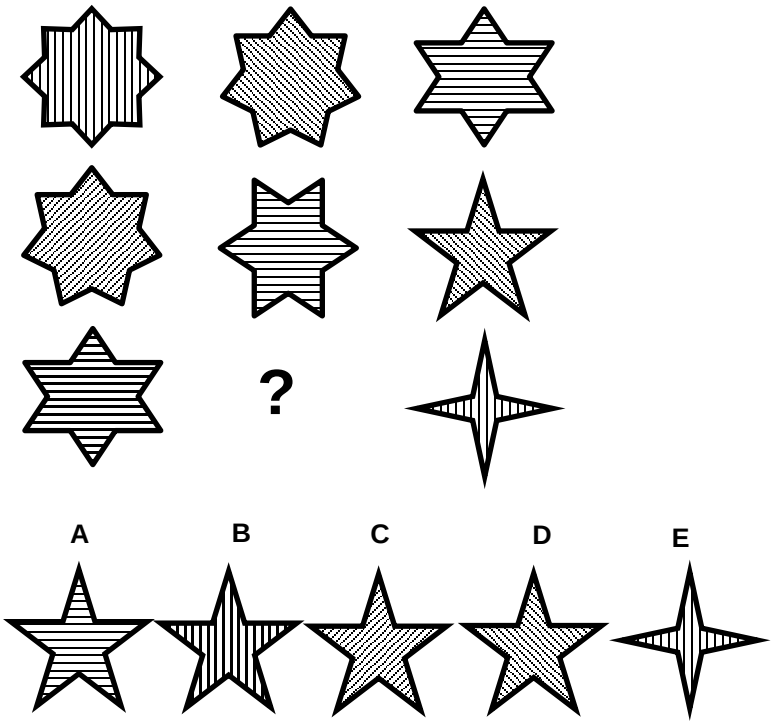
A	B	C	D	E
13	27	23	67	9

Solution: 88 – 21 = 67. 67 - 44 = 23. So 88 – 21 = 67 = 44 + 23. Answer is C

A54. 20 friends go out to the movies and shop at the candy bar when buying the tickets. Half of the group bought popcorn and drink; a quarter bought popcorn, drink and ice- cream and the remainder only bought popcorn. How many items did the group buy?

Solution: 10 (½ x 20) people buy 2 items + 5 (1/4 x 20) people buy 3 items + 5 (1/4 x 20) buy 1 item. So 10 x 2 + 5 x 3 + 5 x 1 = 40 items.

A55. Which shape belongs at ?



Solution: identify the characteristics of each of the images. Each image is a star with a number of points between 4 and 8 and patterned lines in a direction. Observing the decreasing number of points as the images go down, we can determine that ? is a 5 pointed star, so eliminate E. Pattern moves from vertical (0^o or 180^o), to (45^o or 225^o), to horizontal (90^o or 270^o), to (135^o or 315^o) as the shapes move down. Based on this, items A, B and D can be eliminated and the correct answer is C.

A56. Identify the missing number

18	72
30	120

3	12
5	?

A	B	C	D	E
18	36	20	22	14

Solution: Determine the relationships between the matrix on the left and that on the right, and if there is a relationship between the cells in the matrix. Determining the relationship between the left and right 18/3 = 6, 30/5 = 6, so right values are 1/6 of the values on the left. Using this logic, 120/6 = 20, so the answer is C.

A57. Lindy wanted to buy chocolate bars for her friends at school. Sarah wanted the number to be a multiple of 6, Emily wanted the number to be a multiple of 3, Janet wanted the number to be a multiple of 4 and Fiona wanted the number to be a multiple of 2. Lindy bought enough chocolate bars to satisfy her friend's requests. How many did she buy?

Solution: Determine the smallest number that has 2, 3, 4 and 6 as factors. Through trial and error, this can be determined as 12

A58. Four of the following are alike in some way. Please select the other two.

A. Kid
B. Foal
C. Stallion
D. Ewe
E. Lamb
F. Joey

Solution: Determine the characteristics of each item - kid, foal, lamb and joey are all young animals. Stallion and ewe are both adult animals

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A59. What digit is missing from the following sum?

	6	3	?
+	?	8	8
	9	?	0

Solution: Guess the number based on the formula in the ones column, ? + 8 = 0, so 2 + 8 = 10 (where the 1 ten is carried to the tens column). Use 2 throughout the whole formula and confirm: 632 + 288 = 920

A60. An on-time bus travelling at 100kmh encounters road works that slow it down to 40kmh. The road works are 10km long. If these road works are the only delay for the bus trip, how many minutes late will the bus be arriving at the destination?

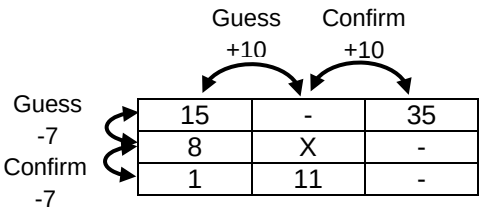
A	B	C	D	E
13	27	23	67	9

Solution: At the un-restricted speed, the 10km of road should have taken 10/100 x 60 = 6 minutes to travel. Due to the road works it actually took 10/40 x 60 = 15 minutes to travel. So delay is 15 – 6 = 9 minutes, answer E.

A61. What number when multiplied by itself is 44 greater than the preceding EVEN number when multiplied by itself?

Solution: 12 x 12 = 144, 10 x 10 = 100. 144 – 100 = 44. So number is 12

A62. Which number should be in the square marked by the X?



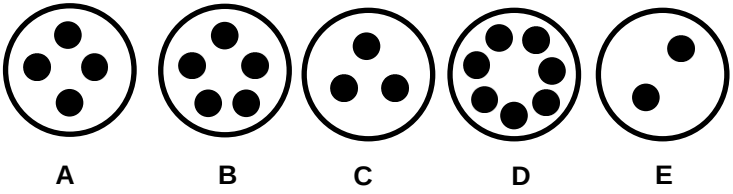
Solution: Confirm the difference between the columns is +10 and the difference between the rows is -7. So on middle row X = 8 + 10 = 18 and confirm this with X + 10 = 28

A63. Choose the answer from the list below which is the closest value to 5^4

A	B	C	D	E
5	20	5000	1.25	500

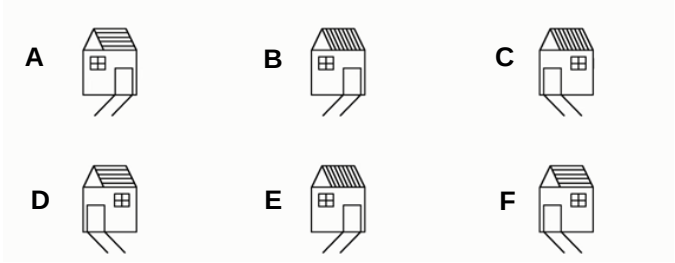
Solution 5^4 = 5 x 5 x 5 x 5 = 625, so answer is E, 500 is closest to 625

A64. Which two of the following five items do not belong with the others?



Solution: Items A and E both have even number of dots, the 3 others have odd number of dots, so A and E do not belong.

A65. Which two of the six items do not belong with the others?



Solution: Identify the characteristics of each of the images. Houses have windows (on the left or right of the house), doors (opposite to the window), roof tiles (either horizontal or angled). Determine if there is a relationship between these characteristics. Item A has a window on the left and horizontal roof. Item B has a window on the left and angled roof. Item C has a window on the right and angled roof. Item D has a window on the right and horizontal roof. Item E has a window on the left and angled roof. Item D has a window on the right and horizontal roof. So Item A and Item C do not belong as the roof and window-side relationships are inconsistent with the others.

A66. What is 1218 divided by 14?

Solution
Using your anchor numbers: 100 x 14 = 1400. Calculate 1400 – 1218 = 182. You know that 10 x 14 = 140, so (100 – 10) x 14 = 90 x 14 =1400 – 140 = 1260. 1260 – 1218= 42. 14 x 3 = (10 + 4) x 3 = 10 x 3 + 4 x 3 = 30 + 12 = 42. So 90 – 3 = 87

Using long division
Start by doing 14 x table
1 x 14 = 14, 2 x 14 = 28, 3 x 14 = 42, 4 x 14 = 56, 5 x 14 = 70, 6 x 14 = 84, 7 x 14 = 98, 8 x 14 = 112, 9 x 14 = 126, 10 x 14 = 140

14 into 12 can't do.
Inspect above, 14 into 121 = 8 with 9 left over
Inspect above, 14 into 98 = 7

				8	7
1	4)	1	2	1	8
	-	1	1	2	
	=			9	8

A67. We have the following series

What is the next shape in the series

A **B** **C** **D** **E**

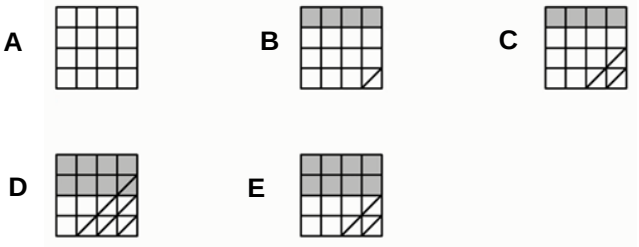
Solution: Identify the characteristics of each of the options. The white section increases by 1/8th of the circle with each step, with the increase alternating from the left to the right of the existing white section. Item D meets these criteria.

A68. The words DETAILED and THOROUGH

A. Have the opposite meaning
B. Have neither similar nor opposite meaning
C. Have a similar meaning

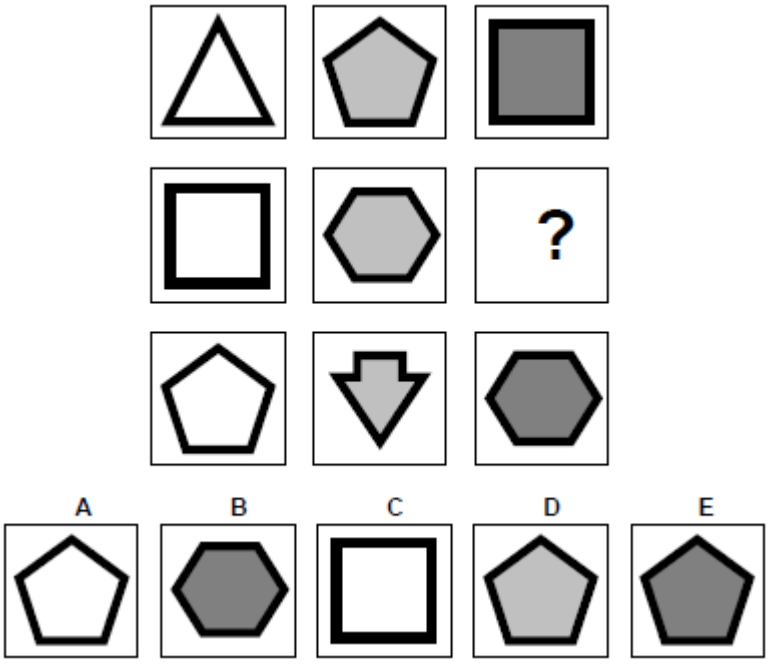
Solution: Detailed and Thorough have similar meaning

A69. Which two of the five items do not belong with the others?



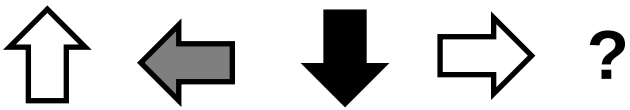
Solution: Identify the characteristics of each image. Each image has lines of shaded cells. Each image also has diagonal lines in the bottom right corner. Item A has 0 shaded lines and 0 diagonal lines. Item B has 1 shaded line and 1 diagonal line. Item C has 1 shaded line and 2 diagonal lines. Item D has 2 shaded lines and 3 diagonal lines. Item E has 2 shaded lines and 2 diagonal lines. There are 3 items with equal numbers of shaded lines and diagonal lines, so items C and D do not belong as they do not have the same number of shaded lines and diagonal lines.

A70. What is shape belongs at ?

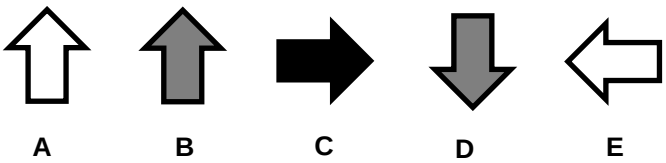


Solution: Identify the characteristics of each of the images. Colour is getting darker each column to the right, so you can eliminate Items A, C and D. Number of sides increase by 1 each row moving downwards, so need 5 sided shape. The correct item is E.

A71. If we have a pattern like the following, what is next?



Identify the next shape in the series



Solution: Identify the characteristics of each of the images. The shading is moving white, grey, black. The arrow point is turning anti-clockwise 90^{o} each step. So you can eliminate A, C and E from the colour only. Item B is pointing up.

A72. There are five Mondays in a certain month. Of three of the Mondays occur on even days, which day of the week is the 11th day of the month?

Solution: Mondays are 2, 9, 16, 23, 30 The 11th is a Wednesday

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A73. Jack is using a block and tackle to lift a 240kg load into his ute. If the MA of this compound pulley is 8, how much effort does Jack need to exert to lift the load?

Solution: The Mechanical Advantage (MA) of the compound pulley is 8, so the effort that Jack needs to lift the 240kg load is 240/8 = 30kg

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A74. Four of the following are alike in some way. Please select the other two.

A. Coffee
B. Black
C. Carrot
D. Chocolate
E. Soy
F. Pumpkin

Solution: Carrot and pumpkin are vegetables. The other 4 are all beans

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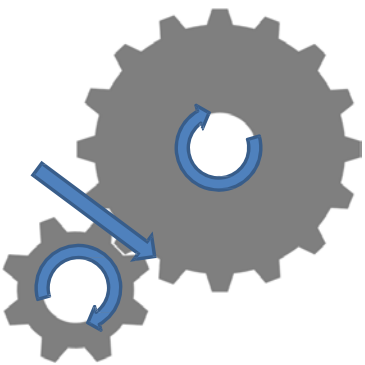
A75. What is wrong with this picture?



Solution: The large gear is turning in the wrong direction

A76. CLASS is to TEACHER as TOUR is to

A. Tourist
B. Tour Bus
C. Tour Guide
D. Destination
E. Itinerary

Solution: A teacher leads and educates a class. A Tour Guide leads and educates a tour.

A77. Which two statements together PROVE that Megan has brown hair?

A. The only hair colour that Jane likes is brown
B. Megan's hair is not blonde
C. Jane has long hair
D. Megan likes long hair
E. Jane likes the colour of Megan's hair

Solution: The correct answer is (A) "The only hair colour that Jane likes is brown" and (E) "Jane likes the colour of Megan's hair"

A78. Four of the following are alike in some way. Please select the other two.

A. Car
B. Boat
C. Bus
D. Run
E. Train
F. Walk

Solution: car, boat, bus and train are transport conveyance. Run and walk are a means of transport.

A79. CAR is to IGNITION as TORCH is to

A. Battery
B. Light
C. Glovebox
D. Power
E. Switch

Solution: A car is turned on by the ignition. A torch is turned on by a switch (E).

A80. Logic-based reasoning:
Purchasing can have a significant effect on an organization's total profit. However, the success of a purchasing function relies on competent buyers and a purchasing manager who employs systematic purchasing methods and implements technological advances. If an organization's profitability is in jeopardy, the efficiency and skill of its purchasing function may determine whether it operates at a profit or at a loss. As such, the purchasing function bears a significant amount of the responsibility for an organization's profit, and, whenever an organization strives to produce a profit, it will expend the effort required to hire capable and qualified buyers as well as a knowledgeable, intelligent purchasing manager.
From the information given above, it can be validly concluded that:

A. If an organization's profitability is not in jeopardy then the competence of its purchasing function will not determine whether it operates at a profit or at a loss.
B. There are at least some purchasing functions that are not responsible for a significant amount of an organization's profit.
C. A non-purchasing function will not bear significant responsibility for the profit of an organization.
D. An organization whose profitability is in jeopardy may depend on the efficiency and skill of its purchasing function to determine whether it operates at a profit or at a loss.

Solution: D is the only logical one that fits, A to C are not valid from the case study

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A81. POLITICIANS is to GOVERNMENT as SINGERS is to

A. Ballad
B. Choir
C. Composition
D. Music
E. Song

Solution: politicians are members of the government group, singers are members of a choir group

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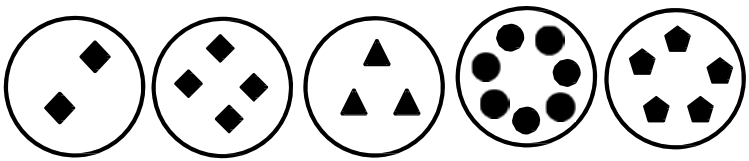
A82. Four of the following are alike in some way. Please select the other two.

A. Float
B. Hover
C. Fall
D. Glide
E. Sink
F. Drift

Solution: Float, hover, glide and drift are controlled floating movement. Fall and sink are uncontrolled dropping movement.

A83. Which two of the following five items do not belong with the others?



A **B** **C** **D** **E**

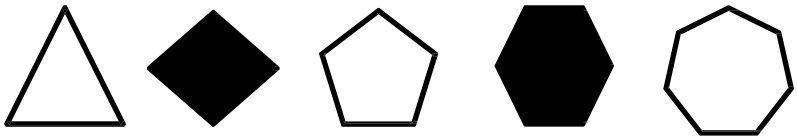
Solution: Identify the characteristics of each shape. Each shape has a number of smaller shapes inside, and each of these smaller shapes have a number of sides. Item A has 2 x 4 sided shapes, Item B has 4 x 4 sided shapes, Item C has 3 x 3 sided shapes, Item D has 7 x 1 sided shape and Item E has 5 x 5 sided shapes. So 3 items (B, C and E) have the same number of smaller shapes as the number of sides on these shapes. Items A and D do not, so they do not belong.

A84. Identify the correct use of words.

"Look over [there/they're/their]!", said Lucy pointing at the ducks. "The cat is eating [there/they're/their] eggs and now [there/they're/their] all upset".

Solution: There (showing distance), their (showing ownership of the eggs by the ducks) and they're (short for they are).

A85. Which two of the five items do not belong with the others?



A B C D E

Solution: Identify the characteristics of each of the images. Shapes are coloured black or white and have varying numbers of sides. Shapes A, C and E are all white with an odd number of sides, while shapes B and D are black with an even number of sides. So shapes B and D do not belong.

A86. PIZZA OVEN is to DOUGH as TOASTER is to

A. Toast
B. Vegemite
C. Bread
D. Breakfast
E. Hair

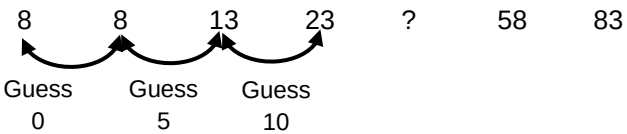
Solution: Pizza is still dough when it goes into the pizza oven. You put bread in the toaster to make toast.

A87. 55% of 500?

A	B	C	D	E
250	275	257	300	285

Solution: 10% of 500 is 50, so 50% of 500 is 250. 5% of 500 is half of 10%, so it is 25. So 55% of 500 is 275. The correct answer is B.

A88. What is the missing number that should take the place of the question mark?



Solution: Guess that the trend difference is increasing by 5 from the previous number: 0, 5, 10, 15, 20, 25. So guess 23+15 = 38 and confirm 38+20 = 58. So ? is 38.

A89. **The following case study is relevant to questions Q89 through Q91 inclusive.**

John and Michelle go out again for dinner with their friends Steve and Bianca to celebrate John winning $1250 in division 6. Each of them has a $28 main and a $12 dessert, they also shared two $20 bottles of house wine and a $50 bottle of champagne. How much of the Tattslotto money does John have after paying for dinner?

Solution: The total dinner bill is 4 x ($28 + $12) + 2 x $20 + $50= $250. So John has $1250 - $250 = $1000 remaining from his Tattslotto winnings

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A90. Steve convinces John to loan him $400 of the prize to put gas into his car, with the promise of 15% interest. How much interest will Steve pay to John?

Solution: Steve will pay interest to John of $400 x 15% = $60

A91. Steve gets his car fixed and the total cost he has to pay the mechanic for the gas conversion is $720. If Steve saves $20 per week in fuel costs, how long does it take for the gas conversion to pay for itself (including interest to John)?

Solution: Remember that Steve needs to pay John $60 interest on the loan from A90. Total cost of the conversion is $720 + $60 = $780. You know that there are 5 sets of $20 in $100, so $800 is 8 x 5 = 40 sets of $20. $780 is $20 (1 set) less than $800, so $780/$20 = 39 weeks

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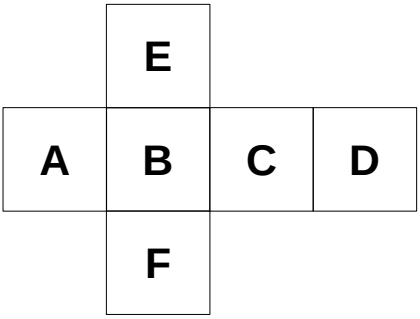
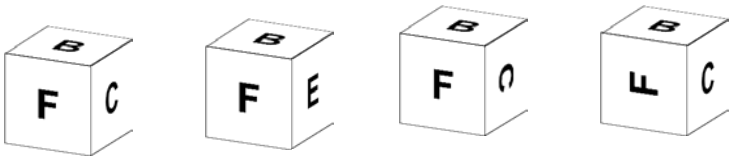
A92. Four of the following are alike in some way, select the other two.

A. Sheep
B. Cows
C. Deer
D. Elephants
E. People
F. Pigs

Solution: Sheep, cows, deer and pigs are generally farm animals. Elephants and people are not and therefore unalike.

A93. Which cube does the following shape make?





A B C D

Solution: When the cube is folded, the bottom of letter B shares a side with the top of letter F. The front side of letter B joins with the back side of the letter C. Faces E and F are opposite, so cube B is dismissed. On cube A, the front side of B meets the top of C, so A is dismissed. On cube D, the bottom of B meets the front of letter F, as well as the top of letter C, so cube D is dismissed. Cube C is the correct cube made.

A94. Ben writes an ebook and sells it on Amazon for $30 each. Amazon charges a fee of 30% per sale. Ben wants to increase sales so offers a 1/3 off discount for a limited time only. How much less per ebook does Ben make when discounted compared to before the discount?

Solution: Fees on the full price book are $30 x 30% = $9, so Ben makes $30 - $9 = $21 per book. Discounted book is priced at $30 x (1 – 1/3) = $30 x 2/3 = $20. Fees on the discounted book are $20 x 30% = $6, so Ben makes $20 - $6 = $14 per book. So Ben makes $21 - $14 = $7 less per book.

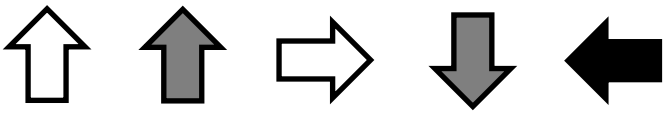
A95. VOLUME is to WATER as DISTANCE is to

A. Flour
B. Cows
C. Road Trip
D. Time
E. Memory

Solution: Volume is a measure of the amount of water. Distance is the measure of a trip.

A96. If we have a pattern like the following, what is the second item missing?

Identify the next shape in the series



Solution: Identify the characteristics of each of the images. The shading is moving white, grey, black. The arrow point is turning anti-clockwise 90^{o} each step. So the first item missing is a grey arrow pointing up. The question asks for the second item missing which is a black arrow pointing left, item E.

A97. It costs Ruby's Garden Ornaments $3 dollars per gnome to make the first 500 gnomes. For a production run of between 501 and 1000 gnomes, all gnomes cost half the amount. Beyond 1000 gnomes, the production cost is $1 per gnome. How much will it cost to manufacture 1,500 gnomes?

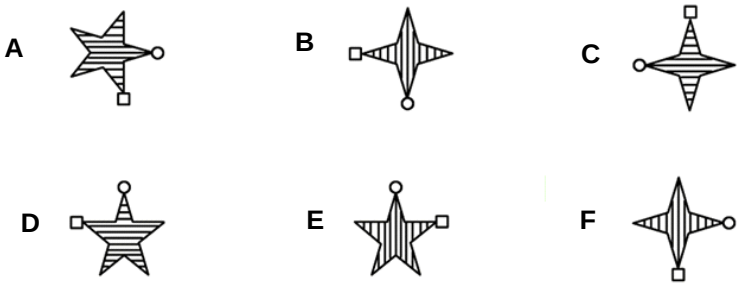
Solution: break the gnome production run into the unit price x the number of units at that price.
First 500 gnomes = $3 each, so 500 x $3 = $1500
Next 500 gnomes = $1.50 each = 500 x $1.50 = $750
Final 500 gnomes = $1 each = 500 x $1 = $500
Total production run = $1500 + $750 + $500 = $2750

A98. Identify the correct spelling for each word

experiance	experience	experiense
perseverance	perseverence	persaverance
acomodate	accomodate	accommodate

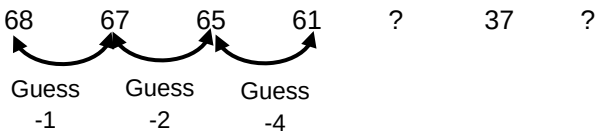
Solution: The student needs to learn the spelling words on page 37

A99. Which two of the six items do not belong with the others?



Solution: Identify the characteristics of each of the images. Shapes are either 4 or 5 pointed stars with line patterns. There is also a circle and a square each on a point. There are 3 of each star shape, so this is not relevant and can be eliminated. In 4 of the cases, the circle is on the point of the star at the end of the line pattern.

A100. Find the missing numbers in the following series



Solution: Guess the trend is doubling each minus from the previous number: -1, -2, -4, -8, -16, -32. Guess the first missing number is 61-8=53 and confirm 53-16=37 and the second missing number is 37-32=5.